

https://dspace.org/

Exploration of the investment drivers, successful factors and constraints in green building development in Gauteng, South Africa.

Pitso, Mpolokeng Malitabo

2017
https://hdl.handle.net/10539/23984

Downloaded from a DSpace repository. https://dspace.org/

Exploration of the investment drivers, success factors and constraints in green building development in Gauteng, South Africa

By Mpolokeng Pitso

Student no: 1276769

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2016

ABSTRACT

The property development industry in South Africa is growing at a high rate and contributing more to the Growth Domestic Product (GDP) of the country than most industries. Although this is a positive factor, the fact that that this industry affects the environment negatively cannot be overlooked: it emits high levels of pollution that degrades biodiversity and disturbs ecosystem services by utilising natural resources. Green building development is one concept that has risen to address this dilemma and contribute towards environmental sustainability.

The purpose of this research is to explore the dynamics involved in Green Building Development. This involves a critical review of the drivers, success factors and constraints in green building developments. An investigation using a case study of 90 Grayston in Sandton, Gauteng was undertaken. Ten in-depth interviews were carried out with various individuals who were directly involved in the development of the building, as well as those individuals who used the building post its development.

The research findings indicate that the financial feasibility, as driven by market demand and cost savings, propelled the decision to invest in green buildings. To make these green buildings a success, the location of the project, the composition, communication and coordination of the development team, as well as the way the project is managed, are vital. The research discovered that the functionality of the green features, the excessive research and reporting documentation required, as well as the social and psychological barriers that lead to unavailability of green compliant suppliers to choose from, all pose a challenge in the successful development of green buildings.

However, if green buildings are effectively developed, they are attractive to blue chip tenants who are cognizant of the importance of corporate reputation. The people who work within the building are happy that the building elevates their status. Green buildings also create a landmark that is referred to reverently. They become the prime assets of the developers and give them better recognition in the industry. The study lays a foundation for further study on

sustainable ways to fund incentives for green buildings in South Africa in order to inspire developers and suppliers to be green compliant.

DECLARATION

I, Mpolokeng Pitso, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

MPOLOKENG PITSO

Signed at ……

On the …….. day of …… 20…..

ACKNOWLEDGEMENTS

I would like to convey my deepest gratitude to people who helped me through this study. To my mother and my brother, you reminded me of my inner strength through which I have conquered greater battles. To my friends and family members who have showed support in different ways throughout this write up, I am sincerely grateful.

I would also like to thank my supervisor, Douglas Taylor. You knew just how to encourage and guide me. I would also like to thank Professors Anthony Stacey and Chris van der Hoven, for organising the research writing boot camp. It was extremely helpful.

Finally yet importantly, I am appreciative to the developer at Redefine Properties, for allowing me to use 90 Grayston as a case study. To all the respondents who cheerfully gave me all the insightful information, I thank you all from the bottom of my heart.

TABLE OF CONTENTS

ABSTRACT ..... **ii**

DECLARATION ..... **iv**

ACKNOWLEDGEMENTS ..... **v**

LIST OF TABLES ..... **x**

LIST OF FIGURES ..... **xi**

CHAPTER 1. INTRODUCTION **1**

1.1 PURPOSE OF THE STUDY 1

1.2 CONTEXT OF THE STUDY 1

1.2.1 SUSTAINABLE DEVELOPMENT 1

1.2.2 GREEN BUILDINGS CONCEPT 2

1.2.3 PROPERTY DEVELOPMENT IN GAUTENG 2

1.3 PROBLEM STATEMENT 5

1.3.1 MAIN PROBLEM 5

1.3.2 SUB-PROBLEMS 5

1.4 SIGNIFICANCE OF THE STUDY 5

1.5 DELIMITATIONS OF THE STUDY 6

1.6 DEFINITION OF TERMS 7

1.7 ASSUMPTIONS 7

CHAPTER 2. LITERATURE REVIEW **8**

2.1 INTRODUCTION 8

2.2 INVESTMENT DRIVERS IN GREEN BUILDINGS 8

2.2.1 RETURN ON INVESTMENT 10

2.2.2 COST SAVINGS 12

2.2.3 CORPORATE SOCIAL RESPONSIBILITY 14

2.2.4 MARKET DEMAND FOR SUSTAINABLE BUILDINGS 15

2.2.5 MARKETING AND BRANDING PURPOSES 15

2.2.6 INCENTIVES AND GOVERNMENT LEGISLATION 16

2.2.7 PROPOSITION 1 18

2.3 CRITICAL SUCCESS FACTORS OF GREEN BUILDINGS 18

2.3.1 AWARENESS AND UNDERSTANDING OF GREEN BUILDING LEGISLATURE 18

2.3.2 PROJECT DEVELOPMENT TEAM 19

2.3.3 DESIGN AND FUNCTIONALITY OF GREEN FEATURES IN THE BUILDING 21

2.3.4 COMMUNICATION AND COLLABORATION 22

2.3.5 PROPOSITION 2 22

2.4 CHALLENGES FACED IN GREEN BUILDING DEVELOPMENT 23

2.4.1 INVESTMENT COSTS 23

2.4.2 SOCIAL AND PSYCHOLOGICAL BARRIERS 23

2.4.3 Lack of incentives for sustainable construction 24
2.4.4 Complexity of green building certification and construction 25
2.4.5 Proposition 3: 25
2.5 Conclusion 26

CHAPTER 3. RESEARCH METHODOLOGY 27

3.1 Research methodology /paradigm 27
3.2 Research Design 28
3.3 Case Study 28
3.3.1 Case site 28
3.3.2 People interviewed 28
3.4 The research instrument 29
3.5 Procedure for data collection 29
3.6 Data analysis and interpretation 30
3.7 Limitations of the study 30
3.8 Validity and reliability 31
3.8.1 External validity 31
3.8.2 Internal validity 31
3.8.3 Reliability 32
3.9 Demographic profile of respondents 32
3.9.1 Role Descriptions 32

CHAPTER 4. DESCRIPTION OF THE CASE 36

4.1 Introduction 36
4.2 Background to the development of 90 Grayston 36
4.2.1 Background 36
4.2.2 Case Description 36
4.2.3 Green Star Criteria and Rating 39
4.2.3.1 Management 39
4.2.3.2 Indoor Environmental Quality 40
4.3 Summary 45

CHAPTER 5. PRESENTATION OF THE RESULTS 46

5.1 Introduction 46
5.2 Results pertaining to the drivers of green building development 46
5.2.1 Learning opportunity 46
5.2.2 Financial feasibility 46
5.3.2.1 Rental Price 46
5.3.2.2 Prime asset for developer 47
5.3.3 Market demand 47
5.3.3.1 Environmental improvement 48
5.3.3.2 Reduced operating costs 48
5.3.3.3 Status elevation 49
5.3.4 Location 50
5.3.5 Legislative Requirements and incentives 50
5.3.6 Conclusion 51

5.4 RESULTS PERTAINING TO SUCCESS FACTORS OF GREEN BUILDING DEVELOPMENTS 51
5.4.2 LOCATION 51
5.4.3 PROJECT MANAGEMENT 52
5.4.3.1 DEFINED SCOPE OF WORK 52
5.4.3.2 PERFORMANCE MANAGEMENT 52
5.4.4 PROJECT TEAM 52
5.4.4.1 COMMUNICATION AND COLLABORATION 52
5.4.4.2 ESTABLISHED RELATIONSHIPS WITH MEMBERS 53
5.4.4.3 PROFESSIONALISM OF TEAM MEMBERS 53
5.4.5 CLIENT / DEVELOPER INVOLVEMENT 54
5.4.6 DEVELOPMENT FACILITIES 54
5.4.7 CONCLUSION 54
5.5 RESULTS PERTAINING TO CHALLENGING FACTORS OF GREEN BUILDING DEVELOPMENTS 55
5.5.1 DESIGN 55
5.5.2 REQUIRED REPORTING DOCUMENTATION 55
5.5.3 GOVERNMENT APPROVAL 56
5.5.4 MATERIAL SOURCING 57
5.5.5 LACK OF PREVIOUS EXPERIENCE 58
5.5.6 EFFICIENCY OF SOME GREEN BUILDING FEATURES 58
5.5.7 LACK OF INCENTIVES 60
5.5.8 CONCLUSION 61

CHAPTER 6. DISCUSSION OF THE RESULTS 62

6.1 INTRODUCTION 62
6.2 DISCUSSIONS PERTAINING TO PROPOSITION 1 63
6.2.1 RETURN ON INVESTMENT 63
6.2.2 COST SAVINGS 64
6.2.3 MARKET DEMAND 65
6.2.4 MARKETING AND BRANDING PURPOSES 66
6.2.5 INCENTIVES AND GOVERNMENT LEGISLATION 66
6.3 DISCUSSIONS PERTAINING TO PROPOSITION 2 67
6.3.1 AWARENESS AND UNDERSTANDING OF GREEN BUILDINGS LEGISLATION 67
6.3.2 PROJECT DEVELOPMENT TEAM 67
6.3.3 DESIGN AND FUNCTIONALITY OF GREEN FEATURES 68
6.3.4 COMMUNICATION AND COLLABORATION 69
6.3.5 LOCATION 69
6.4 DISCUSSIONS PERTAINING TO PROPOSITION 3 70
6.4.1 INVESTMENT COSTS 70
6.4.2 SOCIAL AND PSYCHOLOGICAL BARRIERS 70
6.4.3 LACK OF INCENTIVES FOR SUSTAINABLE CONSTRUCTION 70
6.4.4 COMPLEXITY OF GREEN BUILDING CERTIFICATION AND CONSTRUCTION 71

CHAPTER 7. CONCLUSIONS & RECOMMENDATIONS 72

7.1 INTRODUCTION 72
7.2 CONCLUSIONS OF THE STUDY 72
7.3 RECOMMENDATIONS 73
7.4 SUGGESTIONS FOR FURTHER RESEARCH 74

REFERENCES **75**

APPENDIX A **81**

ACTUAL RESEARCH INSTRUMENT 81

APPENDIX B **82**

NON-DISCLOSURE LETTER 82
THE GRADUATE SCHOOL OF BUSINESS ADMINISTRATION 82

APPENDIX C **83**

CONSENT FORM 83

APPENDIX D **85**

APPENDIX E **88**

CONSISTENCY MATRIX 88

LIST OF TABLES

Table 1: Leadership styles of project managers in green building projects and codes (Zhao et al., 2016) 20

Table 2: Profile of respondents.....29

Table 3: List of propositions 62

LIST OF FIGURES

Figure 1: New Property Developments in South Africa ("Private Property," 2016) 3

Figure 2: Green Buildings in South Africa as derived from (GBCSA, 2016) 4

Figure 3: Overview of Literature Review as compiled by the researcher based on the literature review chapter 8

Figure 4: Respondents' views on drivers of greening buildings as derived from (Low et al., 2014) 9

Figure 5: Four main drivers of green buildings as derived from (Windapo, 2014) 10

Figure 6: Leadership styles of project managers in green projects (Zhao, Hwang, & Lee, 2016) 20

Figure 7: Theory of planned behaviour (Ajzen, 1993) 24

Figure 8: Organogram of Respondents as drawn by the researcher.....33

Figure 9: View of the former building (Allcare House) 38

Figure 10: View of the new building (90 Grayston).....38

Figure 11: Green star rating points achieved (Round 2 Assessment Results and Feedback Report) 39

Figure 12: Elements depicting and contributing to indoor environmental quality 41

Figure 13: A view of the factors that contribute to the energy criteria.....42

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

The property development industry consumes a large amount of energy and emits an equally large amount of waste into the environment. This degrades biodiversity and as a result, it is seen as one of the main contributors to carbon dioxide emissions which exacerbate climate change(Quetier, Regnery, & Leverl, 2014). Development of green buildings is one way in which the industry is participating to mitigate this dilemma. The purpose of this research is to explore the drivers, success factors and constraints in green building developments in South Africa, Gauteng.

1.2 Context of the study

1.2.1 *Sustainable development*

In 1987, the international community, through the United Nations, met to discuss critical issues around the degradation of the environment, as seen through global warming, soil erosion, dilapidation of arable land and pastures, amongst others. The consequence of this was increasing scarcity of resources that seemed to threaten the ecosystem and species, food security, energy sources and industry production, inter alia. A call for sustainable development arose, which conveyed that care is needed to utilise resources to fulfil current human needs without affecting the ability of future generations to meet their own needs (Brundtland, 1987).

Developments that aimed to understand the causes and effects around sustainability emerged. One important tool that followed was the Five Capitals Model, which aimed at linking the economic concept of capital creation and financial profitability to wider social and environmental issues that affect long-term business viability ("Forum for the Future," 2016). The model allows an organisation to reflect on what it has to do to maintain or enhance the value of the five capitals, namely, Natural Capital, Social Capital, Manufactured Capital,

Human Capital and Financial Capital. The importance of considering the impact of an organisation's activities on each of the capitals is that they are all integrated. Hence, a change in one may effect change in the others ("Forum for the Future," 2016).

1.2.2 *Green buildings concept*

Green building is the most popular way for the built environment to mitigate climate change scenarios, but the extent to which they may be industrially sustainable and impactful depends on the value that the investors and the consumers place on them (Comstock, Garrigan, & Pouffy, 2012). They do not only address environmental issues but they provide very important attributes to economic activities in terms of the quality of materials used in their construction as well as the attributes of capital investment (Comstock et al., 2012)

The property development industry in South Africa has made substantial progress since the development of the Green Building Council of South Africa (GBCSA) as 140 buildings have been certified as green. Much of the focus has been on commercial property and now GBCSA is rolling out the program to residential buildings (Kutama, 2015). The GBCSA was formed in 2007 with the aim of providing rating tools, networks, training and knowledge that facilitate and encourage green buildings in the South African property and construction industry. The ratings look at a number of categories of a building development: energy, materials, management, emissions, transport, innovation, indoor environment quality, water, socio-economic concerns, land use and ecology to assess how the developers of the building have tackled each category (GBCSA, 2015).

1.2.3 *Property development in Gauteng*

According to (Reed & Wilkinson, 2008)property development is the act of changing or intensifying the use of land to construct buildings for occupation. There are numerous types of property in which property developers can invest, such as, retail, residential, office, hospitality, industrial and leisure (SA Commercial Property News, 2015). There are also wide varieties of living estates, which have been created to meet the demands of the diverse and

sophisticated South African market. From golf, lifestyle, fishing, eco, wild life to winery and equestrian properties, all of which utilise a large area of the environment and thus disturb biodiversity and the ecosystem in that developed land (SA Property Insider, 2015).

With rapid urbanisation and population increase, the South African real estate development industry is growing at a high rate, with the listed property index yielding 26.6 per cent growth in the face of the harsh macro-economic climate (Group, 2014). In total, the real estate industry, together with the financial and business industry yield the highest contribution to the Gross Domestic Product (GDP) of the country at 20.3 per cent. Their nominal value added is measured at R175 billion to the total GDP of R963 billion in the third quarter of 2014, with 23.2 per cent of this segment contributed by Gauteng's regional GDP (Stats SA, 2015). This demonstrates the current lucrativeness of the property development sector in South Africa, especially in the Gauteng region.

As illustrated in Figure 1, there have been new property development projects in seven out of nine provinces of South Africa with 254 developments. Gauteng has the lead with developments that account for 68 per cent of the projects and these include nature estates, retirement villages, country estates, golf view villages and lifestyle resorts, amongst others ("Private Property," 2016).

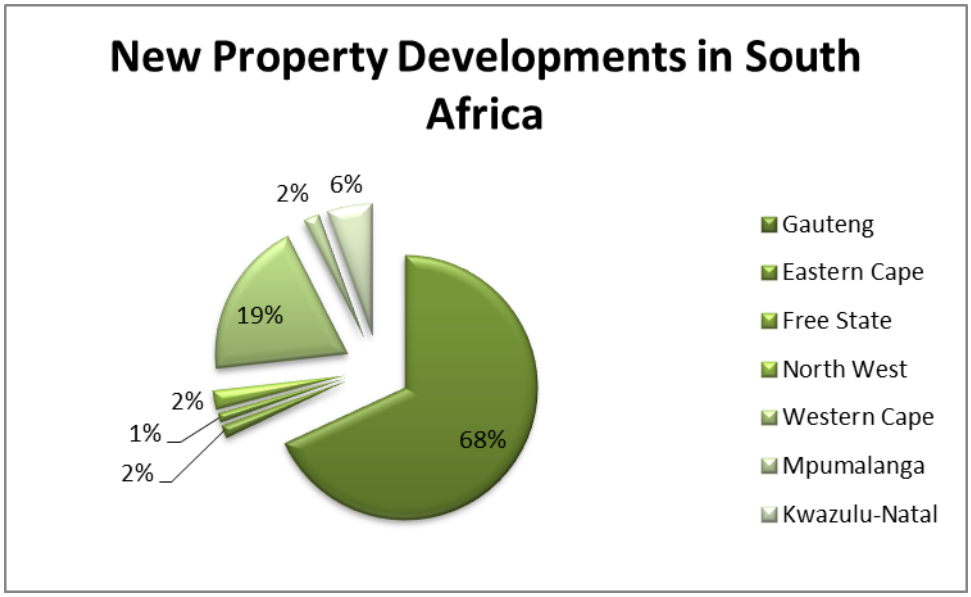


Figure 1: New Property Developments in South Africa ("Private Property," 2016)

In the whole of South Africa, buildings that have achieved green star ratings amount to 219 buildings, of which 120 are in Gauteng, constituting over 55 per cent of green buildings in the entire South Africa (GBCSA, 2016). Figure 2 is illustrative of this.

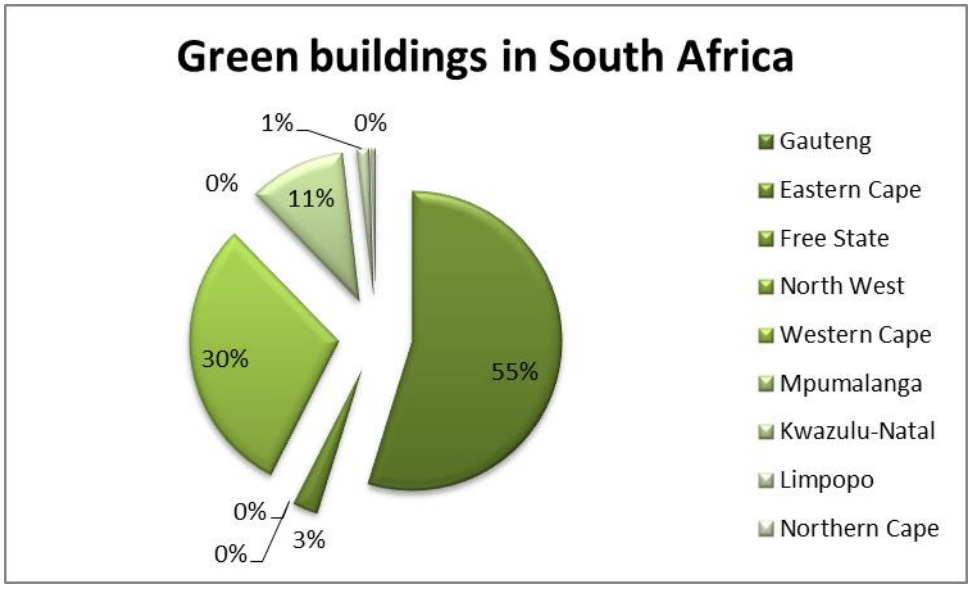


Figure 2: Green Buildings in South Africa as derived from (GBCSA, 2016)

This paper seeks to investigate the drivers, success factors and constraints that influence property developers in their decisions to invest in green buildings. As per the King Code III, every business is a corporate citizen of a country in which it operates and it is important that in its leadership, the board ensure that every decision made encompasses the four pillars of corporate governance namely: transparency, accountability, fairness and responsibility. This is to minimize risk and ensure ethical business practice that considers business continuity, the short term and long-term impacts of their strategic decisions on the society, the environment and the economy of the country ("Institute of Directors Southern Africa," 2012). Property development is necessary to support the economic growth with the construction of industrial, retail, office and leisure and hospitality properties. However, it is equally important to mitigate the risk it imposes on the ecosystem, for the benefit of all stakeholders such as the environment, the society, and all other business stakeholders who play a role in giving the business a social licence to operate.

1.3 Problem statement

1.3.1 *Main problem*

This study aims to explore key factors considered in green building developments in Gauteng, South Africa.

1.3.2 *Sub-problems*

The first sub-problem is to understand what drives property developers to invest in green buildings as opposed to conventional buildings.

The second sub-problem is to explore what makes green building developments successful.

The third sub problem is to discover constraints or obstacles that are inherent in the development of green buildings.

1.4 Significance of the study

There are numerous ways in which researchers have attempted to value natural capital. Their aim is to safeguard natural resources for future generations, while also exploring new opportunities that could foster current economic growth (Martinez-Harms et al., 2015). The concept of green buildings in South Africa is new, as it was only introduced in 2007 by the one and only body, namely the Green Building Council of South Africa (GBCSA). This body advises on green building development and grades the credibility of the buildings that require green certification. With the surging property industry in South Africa, it is important to explore what drives decision makers to invest in green building developments, what makes their development successful, and what constraints are inherent in their development.

The study raise awareness in the property industry of why it is important to engage in green building development, what needs to be in place to make the developments successful and the constraints that can be expected.

The outcomes of this study are important to property developers because they will be motivated to develop green buildings when they understand the greater benefits that a green building has for their businesses and all stakeholders, inclusive of the environment, as compared to conventional buildings. It also cautions them of the obstacles to look out for and provides a platform for further research on how to mitigate these constraints, for example, by the government or policy makers.

1.5 Delimitations of the study

The geographical scope of this research is Gauteng, South Africa.

Since one case study of a green rated project is reviewed, it is deemed as a true representation of other commercial green buildings developed in Gauteng.

The research assesses the study based on accreditation by the GBCSA. No other international standards are used.

1.6 Definition of terms

Biodiversity is a variety of living things, how they interact in the ecosystem, natural communities and habitats. Plants, insects and wetlands are an example of biodiversity ("National Wildlife Federation," 2015).

Ecosystem is the community of living and non-living things and their dependence on one another ("Nature Works," 2015).

Green building is a structure created through an environmentally responsible and resource efficient process throughout the life cycle of the building with the purpose of alleviating negative environmental impacts of the construction environment (Comstock et al., 2012).

Natural Capital refers to the natural resources (renewable and non-renewable) provided by the environment, including the processes and sinks that absorb and neutralise waste, all which are used by the organisation in the production of goods and/or services ("Forum for the Future," 2016).

Sustainable development is development that meets the needs of the present generation without affecting the ability of future generations to meet their own needs (Brundtland, 1987).

1.7 Assumptions

The following assumptions were made in this study:

- All respondents answered truthfully so that the results give the true picture of investment decision criteria.
- The sample was a representation of the population, which comprises the developers of the project case, as well as the tenants post the project development.
- The sample of interviewed respondents was a true representation of the participants in the green buildings development and usage.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature of research relating to green buildings development nationally and internationally. This literature has three pillars; pre project related factors, project related factors and external factors as depicted in Figure 3. The review begins in Section 2.2 by providing a review of factors that drive investment decision making in green buildings. Section 2.3 presents a review on research findings relating to the success factors of green building developments. Furthermore, section 2.4 discusses the obstacles that hinder green building developments, and then section 2.5 concludes the literature review section.

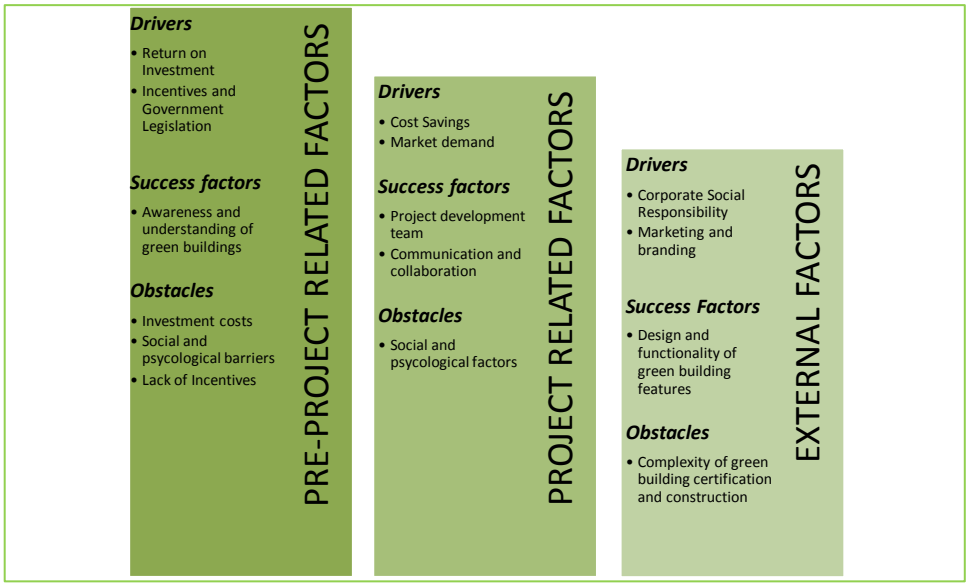


Figure 3: Overview of Literature Review as compiled by the researcher based on the literature review chapter

2.2 Investment drivers in green buildings

(Low, Gao, & Tay, 2014) undertook a study in Singapore where they investigated the drivers of greening new and existing buildings. They discovered nine drivers that influence investment in green buildings. Figure 4illustrates the

ranking of these drivers according to the frequency in which they emerged from the respondents.

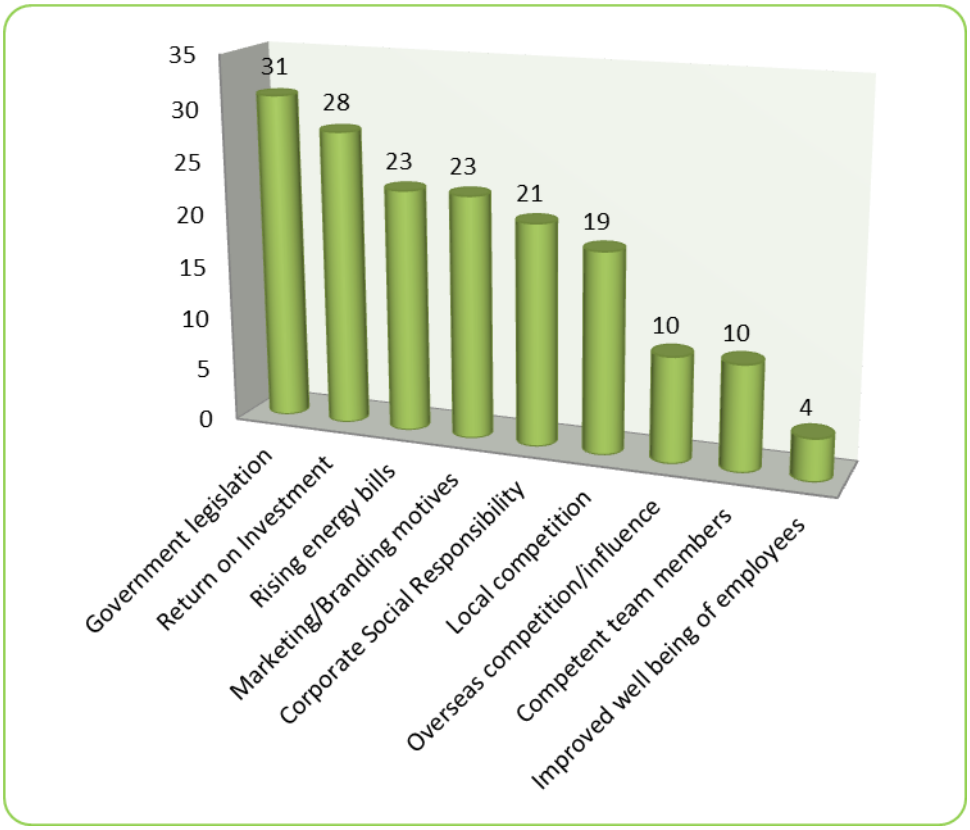


Figure 4: Respondents' views on drivers of greening buildings as derived from (Low et al., 2014)

Another study investigated key drivers in green building development in the Western Cape Construction industry in South Africa. However, it also identified four main drivers categorised into economic factors and ecology/social responsibility factors, as depicted in Figure 5(Windapo, 2014).

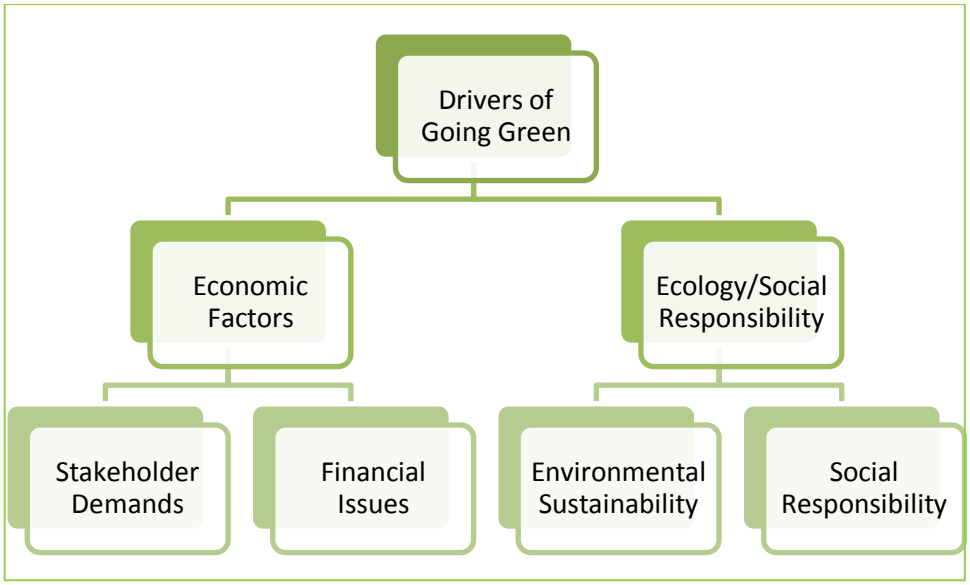


Figure 5: Four main drivers of green buildings as derived from (Windapo, 2014)

Much of the literature review of the researcher identified the following six main drivers.

2.2.1 *Return on Investment*

Investors evaluate financial and risk indicators before they embark on investing in a project, but the underlying expectation is that the investment yields good performance gauged by the company's expected rate of return. Good performance, in turn, depends on the management's ability to utilise company resources effectively, the company's prospects for growth and future developments affected to a certain extent, by the micro and macro environment within which the project operates. Research shows that the operating performance of a company has largely been analysed using financial performance, most often ratio analysis (Hsu, 2014).

(Hsu, 2014) is of the view that investors often do not have sufficient information and lack expertise in making investment decisions, thus this results in erroneous investment judgement. He also asserted that the evaluation criteria are often conflicting, making it difficult to find the appropriate investment criteria. Due to these challenges, he utilises the grey relations analysis (GRA) and the grey clustering analysis (GCA) to investigate investment decision making with

poor information and the multiple criteria decision-making model (MCDM) to generate a compromising decision solution in conflicting evaluation criteria.

Another way in which investors make investment decisions is by evaluating the viability of a project through an appraisal, which is an estimate of the investment value of the prospective company's assets. A good appraisal is one that is accurate, one that closely estimates the selling price and one that is rational. That means that it should reflect market variables that are objectively measured and the subjective estimates of the prospective owner (Baum & Crosby, 2013). This is based on investment appraisal methods, which include the net present value (NPV), internal rate of return (IRR), and the payback period, all of which investment decision makers utilise to establish whether the future benefits derived from the investment will be worthwhile based on the initial capital outflow. The argument is that appraisal of the investment is subject to the person who is carrying it out and that accountants and finance practitioners tend to prefer the profit and net present value while owners, managers, real estate agents and business brokers prefer appraisal of assets over other methods.

A research that investigated the management of carbon emissions in green buildings and the use of low carbon construction methods suggested that this yields accurate building costs information that can be used for activity based costing and life cycle costing as decision making tools in green buildings' investment. Furthermore, these models can be used to get a thorough understanding of how to allocate resources and funding for energy saving activities using approriate cost drivers for each green building (Tsai, Yang, Chang, & Lee, 2014).

Environmentally Extended Input-Output Lifecycle Analysis (EE-IOL) is a tool used to measure the effects of economic growth, and how it affects the environment. It provides a system wide effect that is not limited to boundaries, i.e. countries. The EE-IOL is a useful tool as it forms the basis of other tools, such as the Life Cycle Analysis (LCA) (Ma, Schilizzi, & Zhang, 2015).

Following a case study of the expectations and drawbacks of using EE-IOL in China, the analysis shows that the data is subject to error in terms of falsification of statistics, and standardisation amongst others, and Liu et al.

(2012) maintain that other data sources can help improve the reliability of the statistical data because they can offer comparability, giving a basis to test for validity.

Throughout their life cycle, buildings use natural resources as input and emit waste as output. Another output is the creation of wealth for shareholders and biodiversity offsets in some sort of restoration projects if implemented.

In the study they conducted between 2007 and 2009, wherein they analysed changes in rental prices for certified green buildings versus uncertified buildings, (Eichholtz, Kok, & Quigley, 2010) discovered that the market turmoil has no effect on green buildings. They assert that, with the increase in demand for green buildings and the unprecedented instability in the property markets, the relative returns to green buildings are not significantly affected. The findings indicated that there is less risk in green buildings because, with the decline in the economy, green buildings yielded a better return than conventional buildings. This was attributed to their thermal efficiency, which serves as a hedge against higher rental prices, premium rental prices and higher asset values.

Another study, conducted in the United States, analysed the impact of environmentally sustainable commercial building practice upon economic measures, as measured in the market place. The findings were that green star rated buildings commanded 3 per cent higher rental rates per square foot than other buildings, over 7 per cent premium in effective rents and had a selling price as high as 16 per cent over conventional buildings (Eichholtz et al., 2010). The same authors also believe that sustainable buildings have more economic life, low volatility in market value, hence lower risk premiums and higher asset valuations. They further purported that tenants prefer green buildings because of the high quality indoor environment as it increases employee productivity (Eichholtz et al., 2010).

2.2.2 *Cost Savings*

Experienced practitioners in the property development industry believe that green buildings bring about cost savings, ranking them in the following order,

from the highest to the lowest: energy, water, waste, productivity and health, commissioning and maintenance and emissions (Issa, Rankin, & Christian, 2010). (Gundes & Yildirim, 2015) asserted that during the operations stage of the green building's life cycle, there are long term financial advantages due to energy and water savings. In other countries, cost savings that are applicable to the green building development include specific subsidy programs, carbon trading schemes and favourable tax frameworks (Lorenz & Lutzkendorf, 2008).

The Kyoto Protocol is an international treaty established to control and lessens the harmful waste to the environment. It sets binding targets for developed countries to limit their Greenhouse Gas (GHG) emissions. Through this protocol, the Clean Development Mechanism (CDM) was established. This mechanism enables organisations in developing countries to earn Certified Emission Reductions (CER) if they implement projects that prove to reduce their GHG emissions. Offsetting then occurs when developed countries buy certified emission reductions from the developing countries to set off their GHG emissions to help them achieve the Kyoto Protocol targets (Cuckston, 2013), thus incentivising less pollution. This concept is known as the carbon emissions trading scheme (ETS), where carbon credits trade among GHG emitting organisations.

South Africa vowed to reduce GHG emissions by 34 per cent in 2020 at the United Nations Climate Change Conference in 2009 (Botha & Paulsen 2014). This calls for property developers to evaluate carbon emissions that result from their degradation of forestry, and to offset it against companies that are engaged in projects that restore environmental sustainability, using carbon trading schemes and carbon tax. Initially, this was expected to be enacted in 2015, however in February 2014, a delay announcement was issued to postpone the act to sometime in 2016 (Wentworth, 2014).

In 2011, Eskom developed a standard offer and standard product programmes as part of the Integrated Demand Management (IDM) scheme, which aimed at financially rewarding organisations that achieved energy savings, by, for example, using energy saving technologies. These have resulted in significant energy savings of 3600 MW and increased energy generating capacity equivalent to that of a power plant since its launch. Eskom has put these

incentives on hold due to critical financial difficulties of the national power utility ("Energy Intelligence," 2014).

2.2.3 *Corporate Social Responsibility*

(Lorenz & Lutzkendorf, 2008) are of the view that some property developers invest in green buildings as part of their Corporate Social Responsibility (CSR) initiative, to show that they care about the protection of society and environmental interests. CSR is defined as voluntary company activities which demonstrate incorporation of environmental and social concerns in business operations and when relating with stakeholders (Merrewijk, 2003).

(Babiak & Trendafilova, 2011) also discovered that organisations adopt environmental management practices to drive strategic and legitimacy motives, thus being more concerned about the bottom line more than environmental sustainability.

King III's guidelines to CSR emphasise that organisations are integral to society and should take an inclusive approach to CSR by being genuine in their consideration of all stakeholders, inclusive of the environment. Therefore, they should not only focus on the bottom line, but also rather focus on the triple bottom line: people, profits and the planet ("Institute of Directors Southern Africa," 2012).

(Eichholtz et al., 2010) believe that socially responsible organisations gain in terms of having a higher corporate reputation, less intrusion from activists or governments, improved profitability due to higher employee productivity resulting from improved indoor quality, lower input costs and reduced threat of regulations. Good reputation, in return, attracts better employees, allows charge of higher premium prices to customers and attracts investors (Eichholtz et al., 2010). (Paul, 2008) however, has raised a question to organisations that engage in environmental social responsibility activities, to say what environmental performance outcomes have emerged out of the motives and image that the company presents by going green. It is therefore important that the benefits of green building development to the environment are visible and have a long lasting positive impact on the environment around. When property

development businesses effectively adopt and disseminate environmental norms throughout the industry and when measurement controls are practiced, to measure their effectiveness, a positive environmental impact is achieved (Babiak & Trendafilova, 2011).

2.2.4 *Market demand for sustainable buildings*

In the light of environmental issues, such as global warming, consumers are realising the importance of green properties, hence there are faster sales in buildings which are regarded green than just conventional buildings (Yudelson, 2008). Thus, developers are inspired to develop green buildings since they result in high, quick occupancy rates and lower risk on the return on investment because of the surety that their property will yield a steady income when fully leased within a short space of time.

(Hwang & Tan, 2012) are of the view that the reason why some regions experience a poor demand for green buildings is due to lack of knowledge about the benefits of green buildings, thus customers do not have an interest because they do not fully comprehend the importance of green buildings. They are of the view that the poor market demand results from lack of credible market research. Government incentives that sponsor further research and development in green buildings mitigate these shortcomings. They further purport that the public should be educated about the importance of green buildings to global climate as well as the sustainability of natural resources such as water and vegetation. This will stimulate the desire to make a difference through occupancy of green buildings.

2.2.5 *Marketing and Branding Purposes*

The availability of a green star rating tool that supports the accreditation of a building gives developers the platform to portray their buildings as green; as a result, they use it as a marketing tool to differentiate themselves in the market by building a good corporate image, which subsequently gains them a competitive advantage over other developers (Windapo, 2014). A study that investigated the attitudes of developers towards the principles of sustainable construction in South Africa discovered that many developers are attracted to

the green star label because it better positions their companies in the competitive environment (Seeliger & Turok, 2015). (Eichholtz et al., 2010) asserted that a good reputation derived from green buildings attracts better employees, enables organisations to charge premium prices and attracts investors.

Ultimately, this enhances the environmental image of the developer, making it easier to influence consumers' decision making when deciding to buy or rent their space (Drumwright, 1994). A study conducted in China that looked at factors affecting green procurement in real estate development, revealed that the major factor for developers to implement green buildings is the desire to gain marketing benefits. (McCoy, Walid, & Ralph, 2008) revealed that marketing benefits have certain risks associated with them. These risks include inadequate or inaccurate information pertaining to green building material products that are available in the market, or the unawareness of consumers about the benefits of green buildings, which results in their unwillingness to pay premium prices when buying green building products (Li, He, & Doudou, 2014).

2.2.6 *Incentives and Government Legislation*

In the United States (US), the most commonly used types of incentives are financial (monetary or fiscal or tangible) and structural (non-monetary or intangible) (United States Green Building Council - USGBC, 2010).

The objective of the financial incentives is to compensate for additional costs associated with green building development. They mitigate one of the most challenging obstacles of affordability of green building developments, as developers perceive high costs. Mitigation of this obstacle thus drives investment in green buildings.

These incentives include fee reduction/waivers, for example;

- where fees on plan reviews or building permits by municipalities are reduced;
- where there are tax credits and abatements,
- where after certification of the development, the project receives an exemption from tax or a reduction for tax due;

- where there are awards and marketing assistance,
- where developments that meet pre-specified green building criteria are provided with both financial and marketing promotions.

This is with the aim of increasing the marketability of green building developments and developers' profits. This increases the public awareness of the developer and the building project. The marketing assistance aspect also includes the use of media such as broadcasting and press releases, the inclusion of the development on green building web pages as well as coverage on public signage (Gundes & Yildirim, 2015).

The objective of structural incentives is to provide time and money savings for the green building developments. Municipalities that have financial constraints as their implementation attract little or no costs often use these. Types of structural incentives include expedited review/permitting, where the overall duration of the green building project is reduced through a speedy review of submissions and granting of permits. The reduction time is dependent on the certification level of the project, with higher certification qualifying for a much shorter review period. Another type of structural permit is density/height bonuses, where the developer gains an additional unit permit, either in increasing the floor area ration or the height of the building (Gundes & Yildirim, 2015). This way the developer is able to benefit by renting out additional rental units in the short term and higher rental gains in the long term (United States Green Building Council - USGBC, 2010).

According to (Circo, 2009), where the gains from shortened durations are not enough to compensate for the extra costs of sustainable design and construction, these structural incentives may not be effective. It is also important that there are qualified members of staff who can ensure compatibility of program requirements during the application process (Retzlaff, 2009).

A case study aimed at evaluating the applicability of these incentive programs in countries that are in the early phase of green buildings transition identified the difficulties in the implementation of these incentives and discovered that marketing assistance is the most preferred. It is the easiest incentive to implement as municipalities already have resources that are necessary for its

implementation and they are the easiest to implement as much as award incentives (Gundes & Yildirim, 2015).

(Kibert, 2012) undertook a study in the United States (US), which discovered that the enactment of policies and green rating systems have encouraged the development of green buildings, further mentioning that any change in the legislation would have a high impact on the interest of green buildings. This notion is also supported by another case study in the Western Cape in South Africa which established that the applicable development of the Green Star SA rating system, together with the government policies, has stimulated the development of green buildings (Windapo, 2014). This study urged the South African government to implement building regulations and legislative measures that support green building design and construction. Therefore, the recommendation is that countries that do not have these legislations in place should consider developing them, as they have a high influence on the development of green buildings. (Eichholtz et al., 2010) are also agreeable to this notion. They advocate the need for more aggressive policies for rating, certifying and publicising green buildings in the industry.

2.2.7 *Proposition 1*

The drivers of investors' decision to invest in green buildings in South Africa are mostly the financial benefits, such as return on investment and cost savings, as well as the ability of the buildings to attract the target market.

2.3 Critical Success Factors of Green buildings

This section explores the factors that should be in place in order for green building developments to become a success.

2.3.1 *Awareness and understanding of Green Building Legislature*

According to (Windapo & Goulding, 2015), there is a gap between legislation and practice of green buildings in South Africa. They are of the view that there is high unawareness of the legislation requirements in the property development industry, especially in workers who are on the lower level of the hierarchy. As a

result, the management is more committed than site based workers, and there is a selective implementation of the green building legislation. The challenge is in their understanding of the roles that they play, as well as how these roles contribute to environmental sustainability. Thus, all stakeholders need to have sufficient knowledge of legislation that will influence their perception, attitudes and behaviours and result in higher commitment and impact on the environment (Windapo & Goulding, 2015).

Many researchers also agree with this observation. They are of the view that for green building projects to be successful, development of effective policies that aim to make green buildings a standard practice should take into account a better understanding of all stakeholders' behaviour and concerns (Cole, 2011; Feige, Wallbaum, & Krank, 2011).

A study in Singapore discovered lack of awareness of the benefits of green buildings by the public, due to insufficient research and also a high perception of risk by developers which could be easily cleared by knowledge and understanding through thorough research (Kibert, 2008).

2.3.2 *Project development team*

A group of different people who possess different skill sets erect green building developments. It is important that these people are able to work together as a team. Researchers have confirmed that in the construction industry, there is a positive relationship between a successful project and the project's management competencies and thus the role of the project manager is very important (Ahadzie, Proverbs, & Olomolaiye, 2008; Hwang & Ng, 2013; Turner & Muller, 2005).

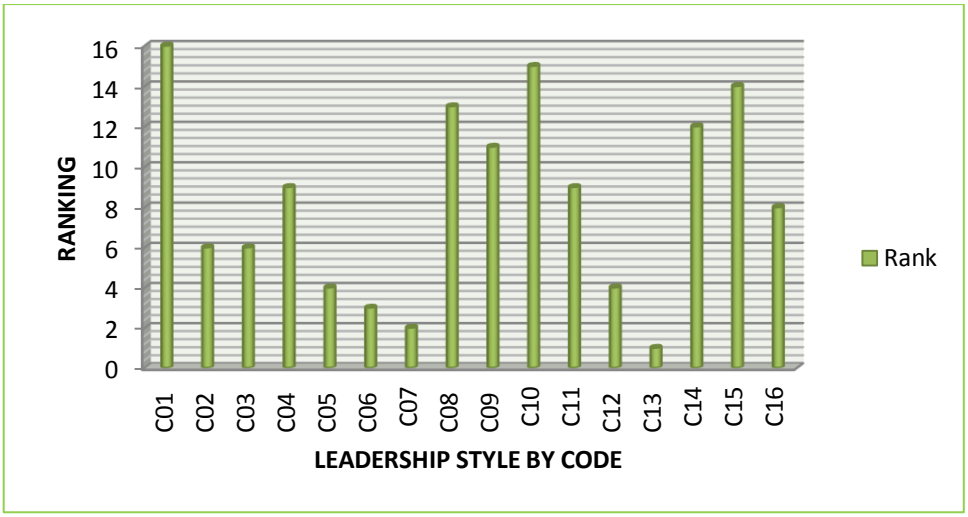


Figure 6: Leadership styles of project managers in green projects (Zhao, Hwang, & Lee, 2016)

Code	Characteristics of leadership	Rank
C01	Make all the decisions without discussing with subordinates	16
C02	Tell subordinates clearly what to do and how to do it	6
C03	Closely supervise the work of subordinates	6
C04	Encourage subordinates to shares their ideas and opinions	9
C05	Work closely with subordinates to determine what needs to be done	4
C06	Direct subordinates with clear roles and goals	3
C07	Have high concern for work tasks	2
C08	Be sensitive to the feelings of subordinates	13
C09	Look out for subordinates' welfare	11
C10	Focus on getting the job done without paying any regard to subordinates' welfare and fe	15
C11	Develop and maintain good relationships with subordinates	9
C12	Encourage two-way communication	4
C13	Strive for work performance and productivity	1
C14	Have high concern for people	12
C15	Empower subordinates with freedom or autonomy in making decisions	14
C16	Delegate work responsibilities to subordinates	8

Table 1: Leadership styles of project managers in green building projects and codes (Zhao et al., 2016)

When commissioning team members in a green building development, the developer has to consider and select those who have experience in green buildings and sustainable construction (CIRIA, 2001). This selection is possible when potential team members submit their Green Request for Proposals (GRP), wherein they assure the developer that they are professionals and they understand the green building concept comprehensively and that they can execute the project efficiently (Hwang & Tan, 2012).

The selection can also be based on criteria such as qualifications, ability to work with other project team members, previous work and demonstration of an understanding of the developer's program and requirements (Kibert, 2008), as

opposed to conventional buildings where selection is based on lowest cost tendered (Hwang & Tan, 2012). (Sandivo & Riggs, 1991) emphasize the level of competence needed in the development of green buildings. They confirm that team members need expertise and technical skills and they must be flexible, decisive and unified in order to be responsive to changes.

The involvement of the developer is also vital to making the project a success. The developer has to be enlightened about green buildings and should possess expressed interest, which will enable her to create and lead efficiently, and ensure a focused project team (Hwang & Tan, 2012). It is important to perform a team building session for important personnel prior to the beginning of the project to familiarise all team members. Specialist sustainability consultants who have a deeper comprehension of the green building concept and who are familiar with the requirements and standards of green certification are the key personnel who guide all other team members and ensure that the project is built to achieve the desired rating for the developer (Hwang & Tan, 2012).

2.3.3 *Design and functionality of green features in the building*

(Elforgani & Rahmat, 2010) mentioned that a building's design, specifically the green building design, could minimise the impact of the construction on the global environmental problems. In addition to solving environmental problems, the design of green building features as well as their functionality, have a positive effect on the asset value, the design and construction cost, the workplace productivity and health, risk mitigation as well as operating costs (WGBC, 2013). This, however, is dependent on how effective the green building features perform in comparison to their design.

Green building design requires deep integration and a holistic design process because of the many unique features it has, compared to conventional buildings (Kibert, 2008). It is important that the designer and the contractor work together from the beginning because the contractor gives expert advice about the feasibility of green building design and features, and thus eliminates time delays or extra costs that can result from the reworking or change in design in later stages of the project (Hwang & Tan, 2012).

The benefits of the green building features tend to benefit the tenants more than it benefits the developer. (Yudelson, 2008) believes that tenants accrue more benefits, such as cost savings in water and energy and better indoor quality, yet the developers have to incur high investment costs, which cannot be passed onto the tenants readily.

2.3.4 *Communication and collaboration*

The design-build system is more appropriate for green buildings than the design-construct-build system used for conventional buildings. This form of building design requires close collaboration and communication because the actual building has to take the initial design form to get green certification. A study in Singapore, which interviewed 31 Industry experts, identified lack of communication and interest amongst project team members as one of the main obstacles that hinder the success of green building projects. Thus for team members to work well together, there should be frequent meetings where members update one another about important information relating to the project (Hwang & Tan, 2012; Sandivo & Riggs, 1991).

(Kibert, 2008) also supports this view. He believes that significant communication between project members is necessary because of the high risk that the project entails, hence every stakeholder should understand the target of the project and the green specifications needed to obtain the targeted certification. There have to be clear communication channels so that project members can report changes effectively between each other and to the project managers and sustainability consultants (Project Management Institute, 2008). This way, they are able to have a good working relationship that creates a positive working environment and keeps the enthusiasm high (Carr, 2007).

2.3.5 *Proposition 2*

The composition of a project team, how well they relate and communicate with each other, is of outmost importance to develop a successful green building project.

2.4 Challenges faced in green building development

2.4.1 *Investment Costs*

Green buildings use a different building approach and use different material and technologies, thus they attract more investment costs than conventional buildings. Developers tend to focus more on high capital costs and not on the lifecycle costs of the development projects, thus this still remains one of the major challenges to green building project developments (Sayce, Ellison, & Parnell, 2007).

In a study of the obstacles in green building project management in Singapore, 100 per cent of the respondents agreed that green buildings are more costly to develop because of the search for green alternatives and techniques used in the construction, as well as in obtaining the certification of the building, and this is the first and foremost hindrance. As a result, it becomes difficult to keep within the budget of the project (Hwang & Tan, 2012).

2.4.2 *Social and Psychological barriers*

(Gluch, Gustafsson, Thuvander, & Baumann, 2013) are of the view that social and psychological barriers hinder the development of green buildings more than technological resistance. This can be overcome by gaining a better understanding of stakeholders' behaviour and issues that are of concern to them with regards to green buildings, so that policies that aim to make green buildings a standard practice include them and are effective (Cole, 2011). (Mukherjee & Muga, 2010) add that the culture of the construction industry is profit focused and forms one of the underlying factors that impede green building development.

Figure 7: Theory of planned behaviour (Ajzen, 1993) shows the theory of planned behaviour. It illustrates that to change the actual behaviour of stakeholders towards green buildings, one has to actually understand their social and moral values which determine their subjective norm, change their beliefs and knowledge based on facts in order to affect their attitudes. This will affect their percieved behavioural control (percieved efforts that are required to

develop green buildings) and their behavioural intention and ultimately affect their behaviour when it comes to green building developments (Ajzen, 1993). (Windapo & Goulding, 2015) established that individuals who are in charge of coordinating green building practice on site are often detested and as a result of social pressures, they often tend to fail to enforce compliance to green building development.

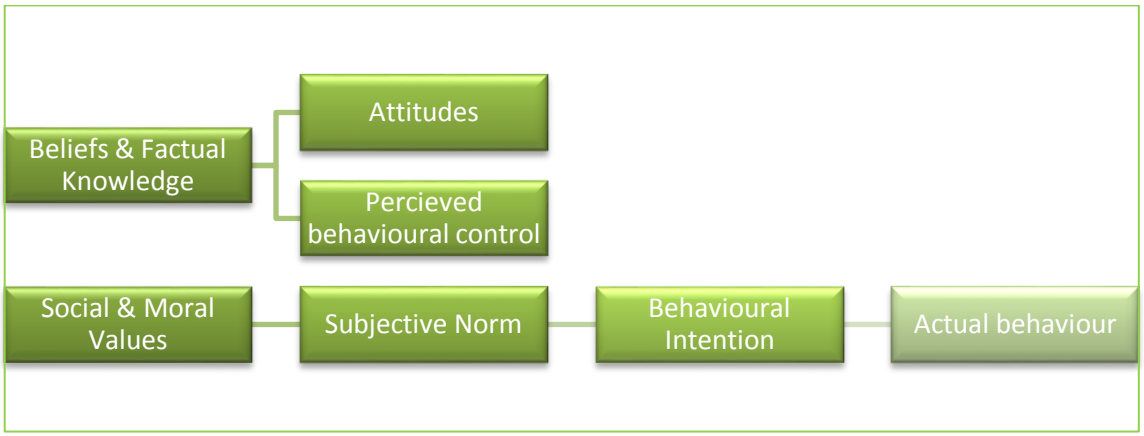


Figure 7: Theory of planned behaviour (Ajzen, 1993)

It has been established that the experience of green building development on environmental policies and procedures is not easily transferable from developed countries to developing countries. This is attributed to lack of documentation of experiences that the developing countries encountered in their project developments (Windapo & Goulding, 2015). As a result, some developers adopt the same management style that they use in conventional building, yet it does not suit green buildings, hence their projects fail. This could have otherwise been avoided if there was documentation of green building experiences that would ease transferability of such knowledge of what mistakes to avoid, thereby ultimately leading to social and psychological acceptance (Hwang & Tan, 2012).

2.4.3 *Lack of incentives for sustainable construction*

Lack of incentives to offset the barrier of affordability of green buildings to developers hinders the adoption of green building practice (Gundes & Yildirim, 2015). (Hwang & Tan, 2012) is of the view that provision of incentives should only be until there is achievement of market demand for green buildings and that the incentives should be expanded from benefiting developers or people

involved in the sustainable construction, to also benefit users of green products and technologies, such as tenants.

It is often the duty of government to provide these incentives. Problems inherent with the provision of financial incentives include lack of satisfactory financial resources and lack of qualified staff for implementation of the assessment, qualification of applicants and the observing of conformance in fee waivers and reduction. To realise efficiency, legislature should govern tax credits and stipulate predefined limits. Another solution to these could be that the fees are increase to balance the fiscal situation (Circo, 2009).

2.4.4 *Complexity of green building certification and construction*

GBCSA has been focusing on certifying new buildings, specifically commercial buildings, hence this has been a limiting factor in retrofitting existing buildings or developing residential property and certifying them as green (Seeliger & Turok, 2015). Moreover, green building developments are guided by specific green measures found in the green building rating system which is more complex and detailed and thereby requires attentiveness and willingness to follow through (Hwang & Tan, 2012).

Green buildings require a holistic and integrated approach wherein the unique design features are the core start of the entire project development (Kibert, 2008). The actual design and construction of green buildings is complicated because of the different system of design and the evaluation of alternative materials that are used (Glavinich, 2008). Considering this, care should be taken that in the project development, the budget, the scheduled period of construction and the quality of the end product are not negatively impacted (Hwang & Tan, 2012).

2.4.5 *Proposition 3:*

Developers are often discouraged from investing in green buildings because of the perceived high cost of investment involved in the development of green buildings, as triggered by social and psychological factors. The absence of

incentives for green building development also accelerates the perceived high costs of investing in green buildings.

2.5 Conclusion

This chapter entails a review of literature relating to drivers, success factors and obstacles experienced in green building developments in South Africa and internationally.

The propositions raised were as follows:

1. The drivers of investors' decision to the development of green buildings in South Africa are mostly the financial benefits, such as return on investment and cost savings, as well as the ability of the buildings to attract the target market.
2. The composition of a project team, how well they relate and communicate with each other, is of utmost importance to develop a successful green building project.
3. Developers are often discouraged from investing in green buildings because of the perceived high cost of investment involved in the development of green buildings, as triggered by social and psychological factors. The absence of incentives for green building development also accelerates the perceived high costs of investing in green buildings.

Suggestions are that although green development certification in South Africa is new, some developed countries have advanced in this field and a lot of research has been carried out regarding sustainable construction. Based on experience, the drivers of investments in green building developments are driven by financial feasibility and factors surrounding this, although green buildings subsequently have a positive impact on the environment. Furthermore, literature reveals that the development process of a green building differs from that of a conventional building. Hence, a number of factors have to be in place to guarantee successful development. The literature also provides evidence of past failures and therefore outlines the obstacles that hinder green building developments.

CHAPTER 3. RESEARCH METHODOLOGY

The research methodology that the researcher chooses is informed by her choice of research design and research methods, however it is crucial to make a distinction between the two: research design provides a framework of how the research will be implemented while the research method can be associated with the different kinds of research designs (Bryman, 2012).

This section of the study outlines the type of research strategy used to research the hypotheses derived from the literature discussed, followed by a thorough review of the research design. It highlights characteristics of the population and sample, with a brief review of the research instrument used in this study. The next section discusses the procedure followed for data collection and data analysis and the conclusion of the chapter discusses the limitations of the study, validity and reliability of data used.

3.1 Research methodology /paradigm

The research strategy used in this study is a qualitative approach because it is able to investigate the behaviour, cognition and attitudes of the respondents and it is believed to answer the how and why of a given research phenomenon, thus providing comprehensive and exploratory tools to achieve a certain process (Silverma & Ramsay 2002).

This method is appropriate because it can build a profound case study by identifying the investment drivers, constraints and success factors of green buildings by the property development industry. The qualitative approach provides a platform for a full investigation and in-depth knowledge of the 90 Grayston green building case. It is also relevant in a purposeful sampling where the researcher interviews specific people who are knowledgeable in the field of study considered.

3.2 Research Design

The research design relevant to this study is that of case study analysis. Because it deals with intangible aspects of decision making, this design used interviews to discuss the entire process with people involved in different aspects of the development of the 90 Grayston Project.

Interviews are advantageous because they are open-ended and thus give room for the researcher to probe for clarity. The respondents can easily relate to the researcher as interviews follow a normal conversation between two people. Thus with less intimidation, the respondents will be able to give answers freely. A case study also enables the researcher to draw on experience and the process followed through to analyse past events.

However, there are disadvantages of using a case study method: it is difficult to generalise the findings of the research and the data collection and data analysis is subject to the skills and interpretation of the researcher (Darke, Shanks, & Broadbent, 1998).

3.3 Case Study

3.3.1 *Case site*

The population of interest in this research is the case of 90 Grayston, which is located in Sandton, in the province of Gauteng. It is the first certified green building for the development company. It attained accreditation as a 4-star green star rating in August 2014 by GBCSA.

3.3.2 *People interviewed*

The sample drawn from this study includes various role players who were involved in the development of this green building project. The researcher used purposeful sampling to interview the various players who are knowledgeable and who had first-hand experience in this green building development, and were deemed reliable and competent informants (Tongo, 2007).

The approval received from property developers, Redefine, paved the way for buy-in from the interviewees. **Table 2** provides a breakdown of the ten participants who were interviewed in this research.

Table 2: Profile of respondents

Respondents	# of people sampled
Project managers	2
Tenants	3
Security Guard	1
Contractors	2
Architect	1
Project developer	1
Total	10

3.4 The research instrument

An interview guide, which listed a set of probing questions, was utilised as recommended by (Denzin & Lincoln, 2005). This was appropriate because the open ended questions allowed for full expression of the respondents' points of view and facilitated understanding and clarity for the researcher by giving the opportunity to probe further so as to make sense of the respondents' intent, therefore making the data more valid. However, the disadvantage with this research instrument is that the researcher may ask the same question differently to respondents and in return, the respondents may give more or less information based on how the researcher asked the question (Turner III, 2010).

The questions covered three areas, namely: drivers, success factors and constraints inherent in green building developments and were worded in such a way that they inform the three research questions. Appendix A potrays the interview guide that was used.

3.5 Procedure for data collection

Requests for interview appointments were firstly requested telephonically and followed up through email. Where the need arose, the researcher physically

went to the respondents' premises to request an appointment. Upon meeting with the respondents, a non-disclosure letter from the university was presented (see Appendix B), along with a consent form that stipulated the objectives of the research and promised confidentiality and an agreement to be interviewed (see Appendix C).

Role players in the project were interviewed individually at their premises. The researcher specifically requested that the interviews be conducted in the area where the respondents feel most comfortable. Some decided to be interviewed in a tranquil gardern while others selected a quiet boardroom. According to (Laslett & Rapoport, 1975), the comfort and the convinience of the respondent is paramount to the yield of a valid response.

To make data transcribing more efficient and accurate, a voice recorder was used to record all interviews. Upon completion of each interview, the recordings were safely stored in a cloud folder, secured through a password that only the researcher knew. The researcher also took down notes during the interviews and kept them safely in the researcher's lockable drawer. Follow-up was undertaken for documentation that the interviewees referred to in the interviews as well as any clarifications to the responses given.

The interviews ranged between 15 – 45 minutes depending on how detailed the respondent were willing to be. A moment of silence between the response and the next question was given to ensure that the respondent was not interrupted.

3.6 Data analysis and interpretation

The researcher used thematic analysis as described by (Bryman, 2012). Recorded data from the interview was transcribed; themes and constructs for interpretation were formulated, based on the relevance of the responses to the research questions and the research focus.

3.7 Limitations of the study

- The different manner in which the open-ended questions were asked may have led to more or less information given by different respondents.

- The use of one green building case may not reflect all dynamics involved in the development of other green buildings because each case has its own merits as an analytical unit thus generalisation cannot be made.

3.8 Validity and reliability

Validity is concerned with the integrity of the findings of the research, while reliability is concerned with how reputable the findings of the study are (Bryman, 2012). (Stenbacka, 2001) is of the view that the quality of a research generates understanding and this quality is evaluated by its reliability, which is determined by how dependable the findings may be.

The respondents to this research were directly involved in the development and some have post experience of this project and they explained their experience in detail. This resulted in the researcher deriving a deeper understanding of the case at hand, and this made the research reliable.

3.8.1 *External validity*

The sample selected included key players, most of who were overseeing and directing the work done. The project was a collaborative effort and emphasis on the importance of the coordination, as much as the doing of the actual work cannot be overlooked. Therefore, external validity of the findings could not be substantiated, because generalisation could not be applied. However, the researcher made an effort to maximise validity by avoiding subjective judgements in the research design and data collection to enhance the validity of the constructs (Riege, 2003).

3.8.2 *Internal validity*

To obtain objectivity and internal validity of the data collected, data source triangulation was used. This is when various sources of data in the form of green star certification documentation, progress reports and certifications reports were further examined, before the analysis of interviews. Specifically, where data was not fully explanatory and where data seemed to conflict with what had been said earlier in other interviews. Moreover, further clarifications of

the interviews were made in the form of emails. (Adam & Kiger, 2005) refer to triangulation and gathering and/or handling of data using multiple techniques within a single study. They are of the view that this confirms apparent findings and ensures completeness of data used.

3.8.3 *Reliability*

Reliability is attained when the findings are consistent if the study is repeated using a similar methodology (Maria & Bicking, 2009). The trustworthiness of the findings was examined by iterative study and follow-ups of each interview to extract a theme relevant to the interview questions that were being asked, thereby ensuring that the responses captured were applicable to the questions asked.

3.9 Demographic profile of respondents

In the sample that was drawn for this study, the experience of the people involved ranged from zero – 30 years, those with less experienced working under the guidance and supervision of other experienced people. Some of the organisations that were involved had little or no experience in the development of green buildings, but the collaboration and support from other organisations that formed part of the development team was helpful.

The plan was to interview role players in the development of 90 Grayston and this was achieved. The perception was that they had first-hand experience in the development of the project. Although this was verified as true, it was revealed that some respondents did not join the project from the beginning, they came in to work in the position of someone who was no longer in the organisation.

3.9.1 *Role Descriptions*

Figure 8 illustrates the respondents and how they relate to one another. To gain an overall perspective of the development of 90 Grayston, responses were sought from people involved in the project development phase, as well as people who were involved in the post project development phase.

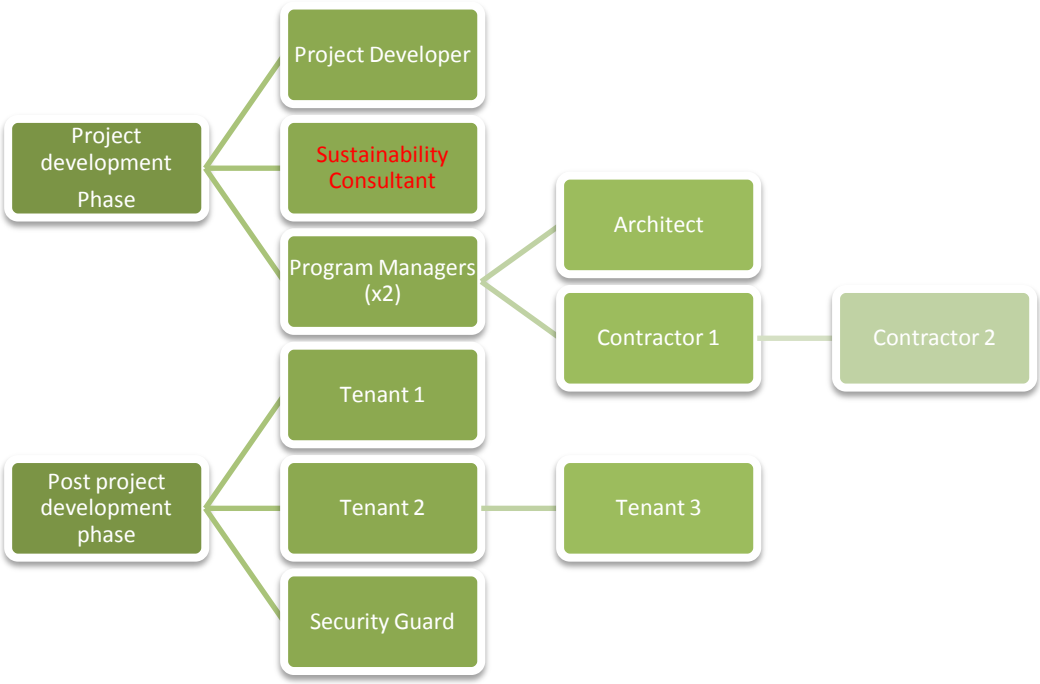


Figure 8: Organogram of Respondents as drawn by the researcher

Project Developer

The primary developer who was involved initially at the start of the project, was involved in the design team, the concept, feasibility and the whole deal together and started with the project, moved overseas. The role of the interviewed developer came in the tail end where he made sure that all items from the construction side were closed off and that tenants moving in were dealt with.

Sustainability Consultant

The role of the sustainability consultant in the project was to coordinate the development and guide all key players in achieving the green building accreditation through the GBCSA standards by facilitating documentation and reporting of each project team and tracking their performance against all green points that needed to be achieved. The role of the sustainability consultant in this research was to put the researcher in contact with all stakeholders who were involved in the development of 90 Grayston. Attempts to have an interview about 90 Grayston with the sustainability consultant were not fruitful.

Project Managers

The role of the project managers was to schedule the project and manage its: (1) costs, (2) team coordination, (3) ensuring the incorporation of green technology into the building, (4) considering costs of chasing green points vs. which green points are more viable to chase, given the budget.

Architect

It was a first time experience for this architect. His team's role was to conceptualise the design of the building. This was according to the brief given by the client (developer). The architect worked together with all other stakeholders, such as the quantity surveyors and sustainability consultant in terms of what needed to be incorporated in the design and what the project could do without, given the targeted star rating by the developer.

Contractor 1

This was the main contractor of the project. He had extensive experience with green buildings and his role is green building coordinator for his company. He managed all subcontractors within the project.

Contractor 2

This contractor fitted the HVAC system within the building. He is an expatriate from a country that is well developed in terms of green building developments. In addition, he is an environmental technologist.

Tenant 1

This tenant was the director of finance and administration of an international company. They were one of the first tenants to occupy the building in February 2014.

Tenant 2

This tenant was the General Manager of an energy consulting international organisation, which has other offices in various regions of South Africa. He manages all the offices in South Africa and has been in the energy sector for a long time.

Tenant 3

This tenant was a senior energy consultant within an energy-consulting firm. His role is to liaise with clients and manage their portfolios; identify opportunities to save energy and subsequently save clients' money

Security Guard

The role of the security guard is to ensure safety of the tenants and the building property. Stationed at the main entrance of the building, he guides people through to the atrium on the fifth floor where the main reception area is.

CHAPTER 4. DESCRIPTION OF THE CASE

4.1 Introduction

This section describes the case of the 90 Grayston Green building development. It gives a background of the 90 Grayston Project and then relates the features that led to its green star accreditation.

4.2 Background to the development of 90 Grayston

4.2.1 *Background*

Redefine Properties invested R505 million to redevelop its first green star rated building, 90 Grayston. This was the beginning of the development company's strategy to go green on new commercial buildings in future. The aim was to obtain at minimum, a 4-star green star rating. Initially Allcare House occupied this address. Redefine Properties took the opportunity to buy this property before demolishing it and erecting an iconic flagship building that established itself as a notable landmark in Sandton.

To them, demolition was more feasible than refurbishment because they wanted to expand the potential of the building and increase its value by making it a high-rise building and targeting green points. Demolition also enabled flexibility in the design and specifications that would better accommodate the target market. The prestige and value that this project added to Sandton was acknowledged by the City Improvement District Manager for Sandton Central Management District (SA Commercial Prop News, 2013).

4.2.2 *Case Description*

The property development industry contributes one of the highest carbon emissions, degrades ecosystem services and exacerbates the effects of climate change. Sustainable construction through the development of green buildings is one way in which these effects can be addressed. This section describes the 90 Grayston case and how it was constructed to address these effects.

90 Grayston is a multiple tenant commercial building situated at the heart of South Africa's business hub, Sandton. It is surrounded by an impressive line-up of blue-chip organisations such as Investec, banking giants and leading legal firms. The area also offers a selection of amenities such as gyms, conference centres, hotels and one of Africa's prestigious malls, Sandton City. This, together with its proximity to the Gautrain station, has rendered the building extremely attractive as a headquarters to a number of blue-chip organisations, thereby meeting the strategic niche market that was targeted by Redefine properties. It is notable that this building was fully occupied by international organisations.

The development had an option of going for a 5-star green star accreditation, depending on whether the score was available. The cost differential between 4-star and 5-star green star accreditation was extremely high and it would have been a reputational benefit more than a financial benefit, thus the developer settled for a 4-star green star rating.

90 Grayston is a 16-storey premium grade office building. It includes nine levels of offices that are above an elevated atrium. It has five basement-parking levels and six parking levels above ground. These were designed with foresight, allowing the two top parking levels to be reclaimable as offices when the use of public transport in South Africa becomes more popular in the future. The building also includes a gym used by tenants and a cafeteria that attracts customers from within and outside the building.

From the start of the project, demolition of the former Allcare House (depicted in Figure 9) was a way that minimised the environmental impacts of the demolition by employing a reputable waste management contractor. The purpose was to identify, minimise or eliminate where possible, the harmful effects of waste material, for example, asbestos, and put aside recyclable material that could be re-used.

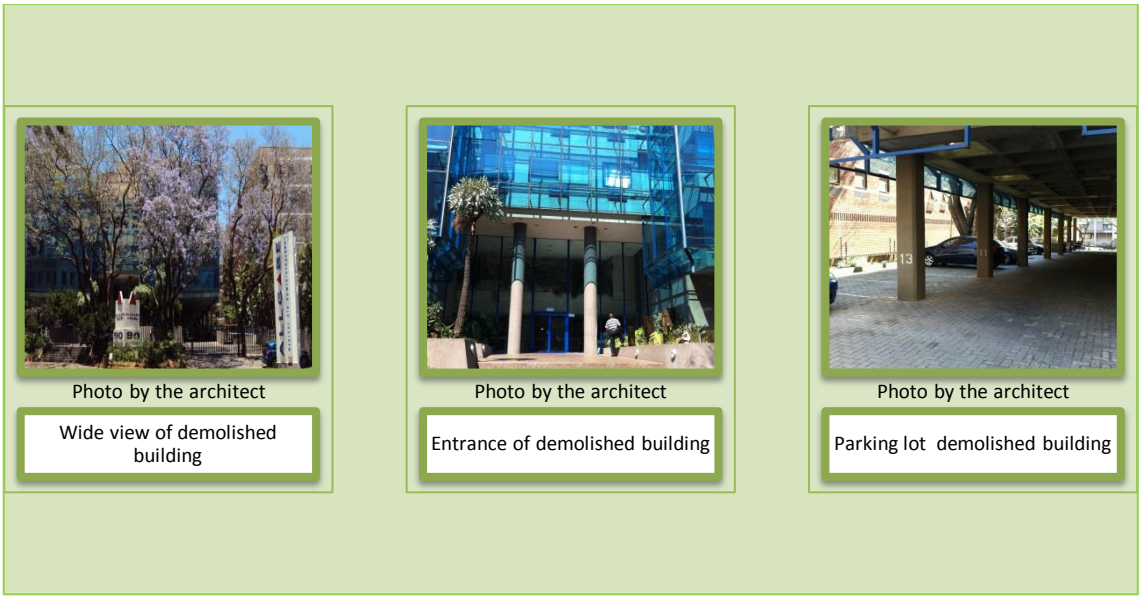


Figure 9: View of the former building (Allcare House)

The main ambition of the design of this building was to deliver a high degree of water conservation, optimal comfort to tenants and offer energy efficient Heating, Venting and Cooling (HVAC) systems. The development made a special effort to reduce harmful effects on the environment and to enhance the internal environment quality for tenants. The outcome was an iconic flagship building as illustrated in Figure 10.

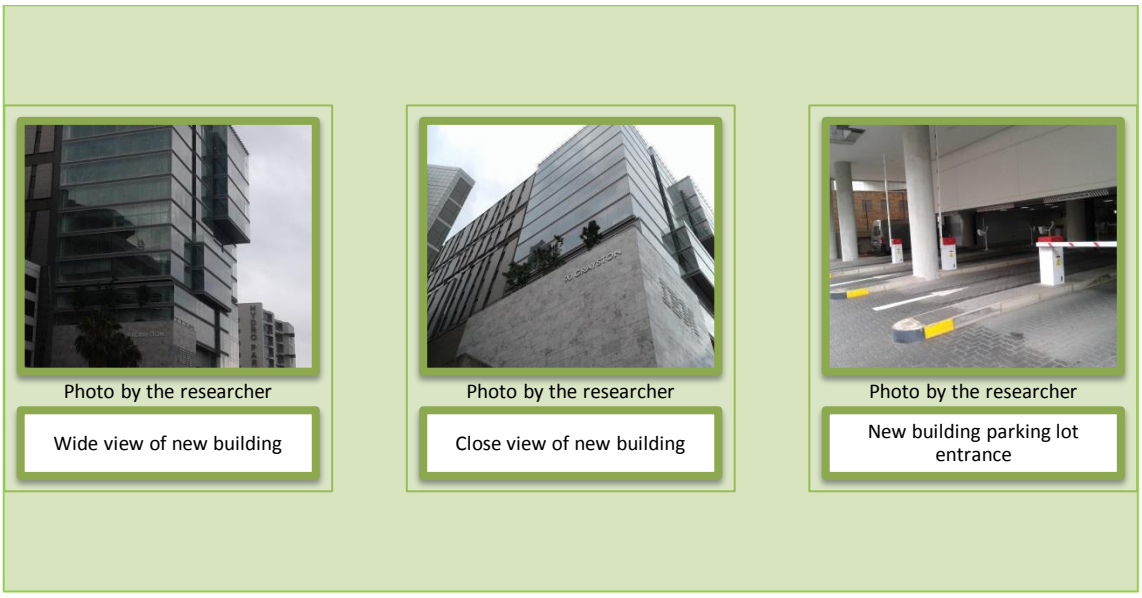


Figure 10: View of the new building (90 Grayston)

4.2.3 *Green Star Criteria and Rating*

90 Grayston achieved a total of 52 points to attain the 4-star green star accreditation, as graphically represented in Figure 11. The project manager provided the researcher with the allocation of points (Appendix D) and the following criteria, which were based on the standard rating tool, developed by GBCSA:

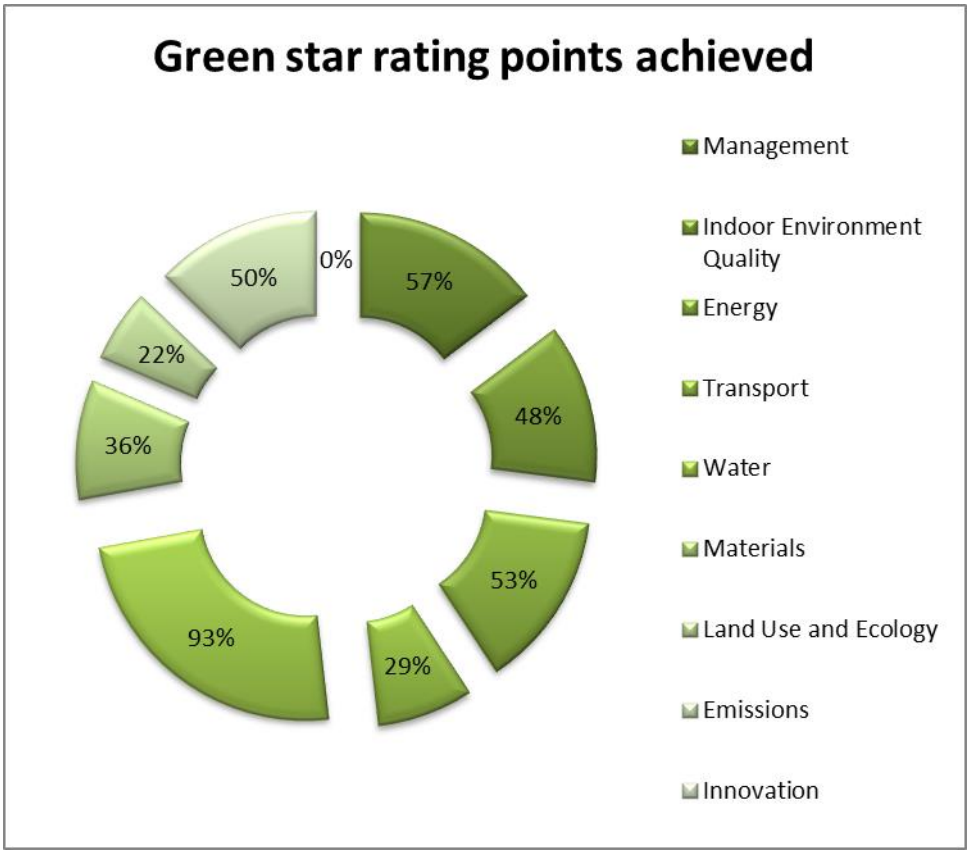


Figure 11: Green star rating points achieved (Round 2 Assessment Results and Feedback Report)

4.2.3.1 Management

The aim of this category is to highlight the significance of a comprehensively assimilated approach to a construction that incorporates good environmental performance. This is achieved through adoption of environmental principles throughout the life cycle of the building, that is: project inception, design and construction phase, commissioning, tuning and operation of the building and its systems. It is therefore imperative that professionals who have an in-depth understanding of the Green Star SA and green building principles are

employed. This also includes professionals in construction management, waste management, professionals who are knowledgeable in minimising pollution and maximising air and soil quality protection, as well as enhancing the commissioning and tuning of building systems.

90 Grayston achieved 57 per cent points in this category, being the second best score in the credit assessment. The project managers, as one of the reasons why the project was a success, commended the professionalism of the team members involved in the project. The sustainability consultant, who is the key accreditation professional, was highly praised by the architect, project managers and project owner. They claimed that she was well experienced in this regard and was able to guide all other members in how they should work towards the green accreditation. The availability of a well-developed Environmental Management Plan that guided construction, as well as the adherence to it, was also a contributing factor to this accreditation. Tenants reported that a manual of prohibited and non-prohibited activities in the building was provided; they were well inducted on how to use the building and how to evacuate in case of fire. Two respondents confirmed that there was a dummy evacuation drill staged by the developer to train them in case a real situation arose. There is a clause in their contract that requires a certain number of every tenant organisations' staff members to be trained as fire marshals, first aid officers and health and safety officers, thus contributing to the highly efficient management of the building.

4.2.3.2 Indoor Environmental Quality

The aim of this category is to ensure that the indoor environmental quality provided is a healthy and comfortable environment for the tenants. Individual climate control, noise levels and external views all relate to the tenants' comfort and, in turn, enables them to be productive. It also relates to the characteristics of a building that minimises harm to the tenants. This harm is caused by indoor pollution resulting from components such as asbestos, volatile organic compounds as well as formaldehyde emissions.

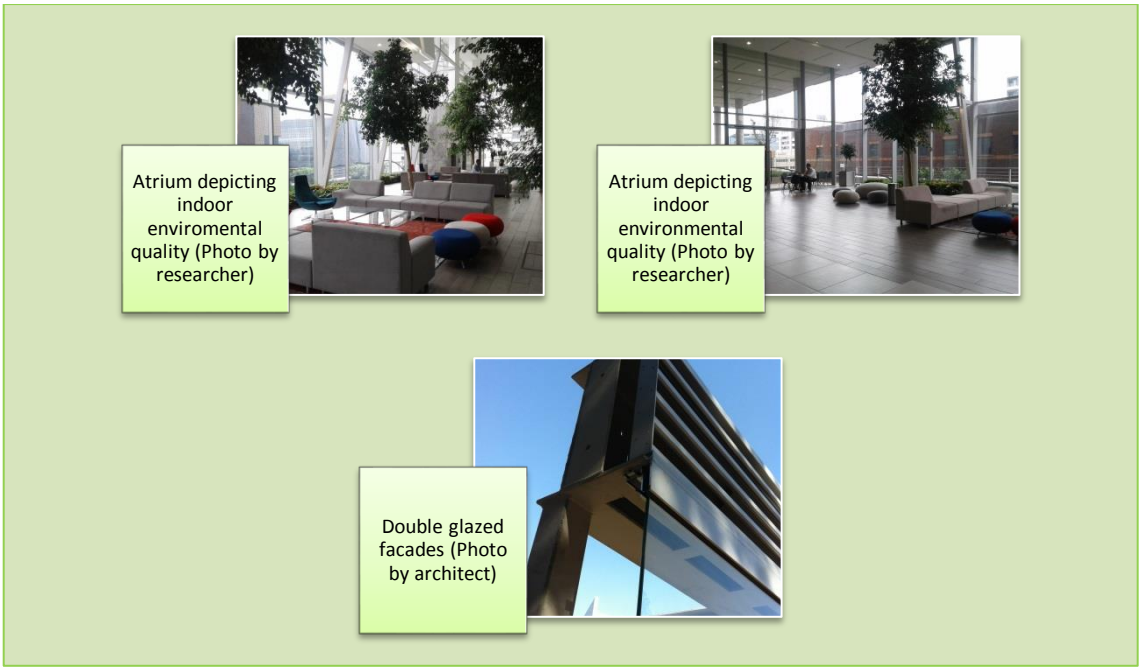


Figure 12: Elements depicting and contributing to indoor environmental quality

Features of the building that addressed this category included an external thermal insulation composition (Etic) wall, which served for insulation of heat. The use of this kind of wall as compared to a wall created out of brick and mortar was that the etic wall is dry and thereby reduces the energy cost related to heating and cooling the building. The building also has a no smoking rule, thus there is no smoking area provided. During my visit at the building, I noticed individuals going out of the building facility in order to smoke. The use of Light Emitting Diode (LED) lights also enabled less energy use and less heat in the environment as they use fewer kilowatts. The materials used in them do not contain toxic substances, such as mercury, found in other kinds of lights. The double glazed facades on the north west and north east of the building, which are two panels of glass with an air gap in the centre also contribute to these criteria by preventing the heat or cold from the outside of the building to come into the building. 90 Grayston achieved 48 per cent towards accreditation in this category.

4.2.3.3 Energy

The intent of this category is to reduce the overall energy consumption of the building through energy efficient design, the use of alternative sources or

efficient use of energy in the building. Energy generation from fossil fuels generates greenhouse gas and other emissions that are harmful to the environment, thus such reduction of energy consumption is crucial. The use of efficient heating, ventilation and air conditioning (HVAC) can also address issues in this category.

The use of punctured windows, with blinds on the west to the building as well the blinds which automatically switch according to the position of the sun maximises the amount of natural light coming into the building thus reducing the need for light using electrical energy. The etic walls, as well as the facades, assist with insulation of the building, thus promoting the efficient use of HVAC systems. The front facades illuminate into a rainbow colour at night and enhance the beauty of the building. These use PV cells and solar panels on the roof, resulting in a massive savings of energy and lower demand on municipal supply. A 53 per cent point rating was achieved in this category.

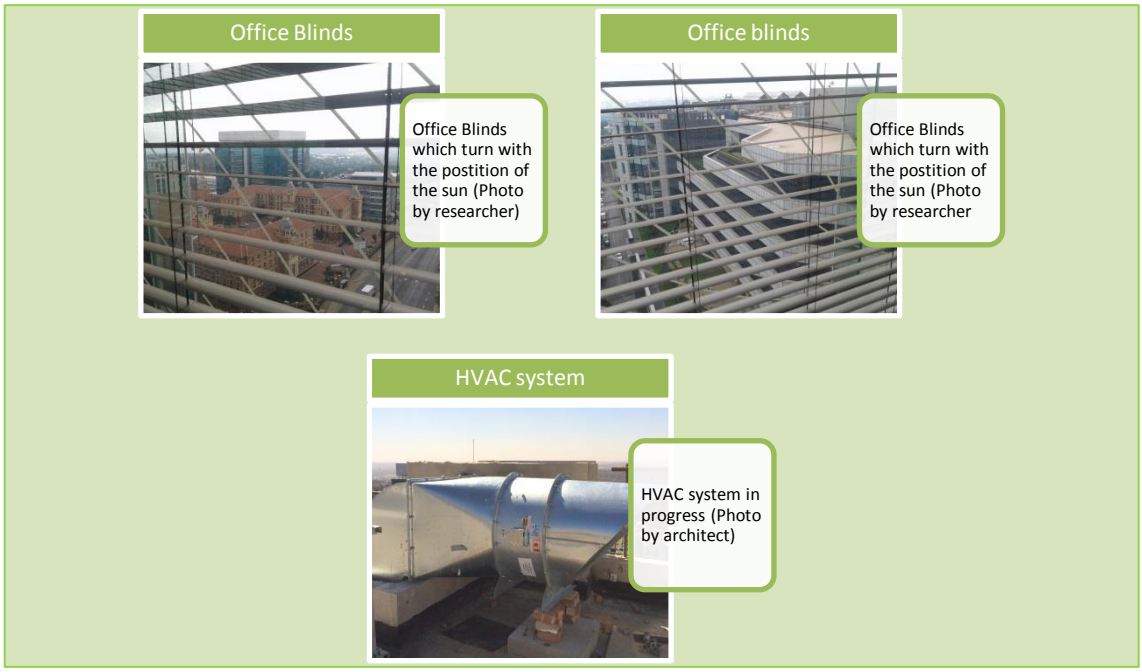


Figure 13: A view of the factors that contribute to the energy criteria

4.2.3.4 Transport

This category purports that motor vehicles generate high levels of pollution from their creation, use and supporting infrastructure and services. As such, the aim of this category is to reward a building that facilitates alternative transportation such as train, minibus taxis, ferries, cycling, pedestrian, buses and light rail and

trams to automotive commuting. Collective use of emission yielding transportation minimises pollution. Walking and cycling are more sustainable because they do not pollute the environment. It is therefore ideal that the design of the building, its location and facilities support the switch to alternative transport modes.

The proximity of the building to the Gautrain station contributed to these criteria in that the tenants are encouraged to use commuting mass transport thus saving a lot of requirements of fuel transportation that release toxic emissions. The enormous parking area of 11 floors also contributed towards the 29 per cent accreditation in this category. One respondent mentioned that subsequent to the accreditation, was the Eco Mobility Festival organised by the City of Johannesburg. This enhanced this category by creating larger pedestrian walkways, dedicated lanes for public transport and bicycles. In this way, they created awareness that encouraged alternative means of transport in Sandton. Fortunately, Grayston Drive was also allocated some of these structures. If there was a post development accreditation review, more points could have been earned by 90 Grayston due to these structural changes. The accessibility of the location from the highway and neighbouring suburbs contributed to this accreditation.

4.2.3.5 Water

Water is a scarce resource but crucial to support life. South Africa falls in a region that has unreliable and low rainfall, thus this category seeks to reduce portable water use through rainwater, grey water, black water collection, water recycling and efficient design of building systems. This is beneficial in that it protects and ensures the availability of this valuable resource in the future. It is also beneficial to building owners or tenants as it saves operational costs.

This criterion was the highest rated at 93 per cent. The drainage system of the building is connected to rainwater tanks. Rainwater is harvested for re-use to flush the toilets and for irrigation purposes. This substantially lowers the demand for municipal supply. The building also has three tanks in the basements as reservoir for contingencies that may disrupt the water supply in the building as well as to supply the fire system.

4.2.3.6 Materials

This category measures the consumption of resources and aims to reduce the amount of natural resources used. It advocates for reusable and recyclable materials for pollution reduction and supports efficient management practices, for example, the use of sustainable timber from a sustainable forest. It also addresses reduction of harmful materials in the building development. Assessment is made of the entire life cycle of the building.

A 36 per cent rating was achieved in this category. The location of the building was advantageous because Johannesburg is a business hub and a variety of built material was easily sourced locally. However, the contractor pointed out that there is a great challenge in the availability of green accredited suppliers to choose from in the region. He mentioned that some suppliers' find the green accreditation route expensive and that it does not tie in with their business strategy, thus they would rather leave it for the future when they have enough resources to go green. The unavailability of advanced green technology locally resulted in the flow of imported material thus decreasing the credits in this regard.

4.2.3.7 Land and Use Ecology

The aim of this category is to reduce or improve the effects of the built environment on the ecological systems and biodiversity, which include, but are not limited to, animal life, vegetation zones and wetlands. Property development can degrade, pollute biodiversity and disrupt ecosystem services, and thereby escalate climate change effects.

The only point that was achieved in this category is that which relates to the reuse of land. The demolition of Allcare House, which previously occupied the address, was sustainable because waste management was carefully and thoroughly undertaken. This resulted in 22 per cent points achieved in this category.

4.2.3.8 Emissions

The credit rating in this category addresses the emissions that create long-term damage to the ozone layer because any harm to the ozone layer exposes living organisms to harmful radiation from the sun and also results in global warming. These targeted emissions include light traveling into the night sky or going into neighbouring properties. This interferes with the behaviour of insects and nocturnal animals like bats. The building industry uses harmful substances, for example, in refrigeration and insulation materials, thus during heavy rains, polluted water can pollute streams and rivers as storm water is transported separately from sewerage water and is not filtered or treated.

The points achieved in this criterion amounted to 50 per cent. One would believe that the blinds that move with the position of the sun could contribute in the light pollution point in this criterion, yet no point was achieved for light pollution. It may have contributed to day light glare control point under indoor environmental quality.

4.2.3.9 Innovation

Over and above the credit ratings recognised in other categories, the aim of this criterion is to recognise, encourage and reward invention of designs, technologies and processes for building applications that influence the environmental performance. An invention is recognised if it has been used by no more than ten projects rated using the same rating tools.

There were no weightings in this criterion. The technologies used had been awarded in ten projects by GBCSA, thus were not deemed inventive.

4.3 Summary

This chapter reflects on the criteria used by GBCSA and relates to how 90 Grayston worked to achieve the 4-star green star rating.

CHAPTER 5. PRESENTATION OF THE RESULTS

This chapter presents the results of the data collected.

5.1 Introduction

To provide a clearer context, presentation of data collected during the in-depth interviews with people involved in the green building development and people who have used the building post the development is in a form of summaries as well as direct quotes of what the respondents said. Identified themes are articulated under each of the research questions.

5.2 Results pertaining to the drivers of green building development

5.2.1 *Learning opportunity*

In South Africa, green building developments are new, since the accreditation body has been in existence for less than ten years. Two of the respondents mentioned that 90 Grayston was a first time green building development experience for them and as such, they got involved in it because they saw it as a learning opportunity as there is lot of research that has to go into it. They found the project interesting and exciting and felt that it was a great contribution towards their career development.

5.2.2 *Financial feasibility*

The property developer reported that their decision to go green was more of a financial benefit than a reputational benefit or benefit to the environment.

5.3.2.1 Rental Price

The developer mentioned that their aim was to target a high value niche market made of blue chip international tenants. Another respondent also pointed out that green buildings give the opportunity to charge lucrative prices, thus gives

the project the prospect to yield a shorter payback time and a higher asset value going forward.

Another respondent mentioned that the high capital costs involved in green building developments often deter property developers from investing. However, there would be keenness if they could see their benefits in operating costs savings, low vacancies and higher rentals. She mentioned that the buildings are cheaper to run, allow for higher rental charges and therefore result in higher returns on investment.

5.3.2.2 Prime asset for developer

The property developer was of the view that this project was a going to be a landmark in the Sandton area going forward. Since 90 Grayston was the first green building for the development organisation, the developer believed that this development was a prime asset of very high value to the organisation.

One project manager agreed to this notion as she referred to the building as an iconic landmark that is noted by many people.

5.3.3 Market demand

The contractor felt that *"Green building development is not compulsory in South Africa, but big entities go green because of marketing purposes".* When 90 Grayston was built, it was built as a white wall, with no tenants signed in the beginning; however it took only three months for the building to be occupied by the exact market that the developer had targeted, showing that there was high demand for green building developments.

Another contractor shared the same view. He mentioned that for their organisation, working in green buildings was not a conscious decision; it was a result of the pull from what the market demanded as the potential customers became more conscious of climate change, so their organisation also had to cater for green developments.

5.3.3.1 Environmental improvement

The property developer mentioned, *"The market is dictating that there are many tenants out there looking for green buildings … they would at least have a green footprint, their working environment would be better and they would have a new space".* The notion that tenants are conscious of their footprint indicates that they want to contribute to environmental improvement.

The security guard also mentioned that most visitors of the building comment on how beautiful it is. He said that people who are working in the area around the building often use the cafeteria in the building. He attributes this to the relaxed environment of the building.

A tenant in a managerial position also mentioned that the environment in the building generally makes people sit up and work. Another tenant in the energy sector had a different view. He said, *"... productivity is more or less the same, in fact a little bit lower because of late coming due to the Sandton traffic".*

The other tenant who was also in a managerial position, mentioned that the building has instilled a more conscious behaviour of recycling to the employees. According to the lease of the building, tenants must purchase different colour bins to enable ease of different material recycling. Contrary to other tenants' views, this manager is of the view that the motion sensor lighting is a drawback in terms of productivity, especially at times when there is no traffic in the office. *"If I am sitting alone in the office, working late, I'll be working and suddenly there is no light. I will have to stand up and walk around to get the lights on back again. It works more for the light outside and in the parking lot. Not in the offices".* To add on to this, he mentioned that as much as the glass on the building is aesthetic, there is too much light coming in the building, causing glare that hinders productivity. He suggested that the windows be tinted.

5.3.3.2 Reduced operating costs

The property developer was of the view that the market is dictating that there are many tenants out there looking for green buildings for the simple reason that they can reduce their operating costs. Therefore, they might be paying a little more on their rental, but their operating costs will be lower and it will work

out into the same way if they occupied a normal building where they were subjected to the usual charges.

The other tenant, who was a senior energy consultant in the organisation, had a different view and said that in terms of electricity they are spending more or less, what they used to spend in their previous building. The key difference is that the lighting was sensitive to movement, thus switches on and off according to the movement in the room. He further said that the developers may have taken certain steps to reduce the accrued energy usage and the carbon footprint, however, the solar panels are too small, hence account for a very small percentage of energy, compared to the electricity used from Eskom.

His colleague also shared the same sentiments. *"But in reality as an average company which is consuming electricity, there is a very negligible difference between what we were paying in the old building and what we are now paying in this green building, and we do have it separated".* He attributed this to the fact that the air conditioning has to work twice as hard to cool the offices, which are heated up by the natural light from that comes through the glass.

5.3.3.3 Status elevation

One of the tenants mentioned that their occupation of the building has elevated their corporate status to match that of peer organisations internationally and also be in the centre hub, thus implying that green buildings promotes the reputation of the organisation and makes it more attractive in the market.

Another tenant said that she feels proud and important to work in a green building. She mentioned a story of when she got off from the taxi in the morning; people were shocked and asked her if she works in this building and what position she holds? She clearly held the building dear to her as she mentioned that she loves it.

Another tenant, who is at a managerial position felt that her employees are much happier because of the prestige of the building and the facilities it has such as the gym and cafeteria. *"I feel the move to this building had quite a general uplifting feeling for the staff, to be in a prestigious building like this definitely makes people sit up and work a little happier."*

As mentioned by two respondents, this made the development organisation recognised in the industry. This is evident in it achieving two awards, over and above the 4-Star green star accreditation from GBCSA. 90 Grayston received the "Best Green Star Rated Commercial Building for 2015" and the "SA Property Owners Association Award".

On the contrary, the tenant who also happened to be the general manager of the organisation pointed out that the fact that the building was green did not have any bearing in their decision to occupy it. *"In South Africa, our views of going green still have a lot to do with marketing than it has to do with a genuine care for the environment. If you look at green buildings and who is doing it? Mostly It is all for marketing and advertising purposes. It is all the big people, the big banks. It is because it makes them look good. Do you see a reduction in your banking fees? No you don't".*

5.3.4 Location

One tenant, who also happened to be the general manager of the company in South Africa, mentioned that the address of a company is important, hence why they chose to occupy 90 Grayston. *"The choice of the building had to do more with the location where it was a positioned, the address. These things can be very important from a marketing point of view, if you look around the globe; all our offices are in key financial hubs of those countries: Paris, New York, Sidney, Brussels … and that gives clients comfort that they are not dealing with a one-man operation. Knowing the type of clients that we deal with, they expect stability. Therefore, choice was about where the building was located. It had nothing to do with green buildings".*

5.3.5 Legislative Requirements and incentives

One contractor, who was an expatriate, was of the view that with the on-going political discussions in terms of legislative requirements that aspire to regulate environmental responsibility through rewards from procuring materials from a green supplier or sanctions like carbon tax, could be drivers of investment in green buildings. Many companies would want to be in the forefront in the green space when the legislation is endorsed. In his country, green building

development was compulsory, hence he felt that South Africa was a bit behind and such measures had to be legislated before South Africa could catch up with his country.

5.3.6 Conclusion

Literature proposed that the drivers of investors' decision to invest in green buildings in South Africa are mostly the financial benefits, such as return on investment and cost savings, as well as the ability of the buildings to attract the target market.

The majority of respondents seem to believe that investment in green building is driven by reputational benefits. They are of the view that green buildings are prestigious in their nature, thus are highly regarded, giving them advantage in attractiveness and status over conventional buildings. The tenants are driven to occupy green buildings because they want to elevate their status and be more corporate, thus more marketable. Financial viability motivated the developer more than the reputational benefits.

5.4 Results pertaining to success factors of green building developments

5.4.2 Location

The project manager mentioned that the location of the project made it easier to procure resources, thus reducing the carbon footprint. Another respondent also mentioned that the proximity of the building to the city centre where there is accessible transportation and facilities like banks, amongst others, is what made it a success as the tenants had all they needed within a small radius. One tenant also mentioned that the location of the building is ideal because it is close to corporate clients and transportation is easier for staff members. She mentioned that they have an excellent external view from their boardroom, as they are able to view the whole of Sandton.

Another tenant emphasised the importance of the location by saying: *"The choice of the building had to do more with the location where it was a*

positioned, the address. These things can be very important from a marketing point of view, if you look around the globe, all our offices are in key cities, good addresses… and that gives clients comfort that they are not dealing with a one-man operation. Knowing the type of clients that we deal with, they expect stability. So choice was about where it was and the location".

5.4.3 Project management

5.4.3.1 Defined Scope of work

Respondents who were involved in the development mentioned that the job was a success because everyone knew what was required from them. There was a defined scope of work with which everyone aligned their day to day tasks in making the entire project oriented to one goal, thus giving it a focus.

5.4.3.2 Performance management

Interviewed project team members all agreed that there was consistent monitoring in place in the form of continuous reporting on how far each member of the team was in relation to tasks required from them. The defined scope of work made it easier for continuous performance review.

5.4.4 Project team

5.4.4.1 Communication and collaboration

The project manager mentioned that the project team was what made the building a success, mainly because of the way communication flowed between team members. She mentioned that there were weekly meetings, which enabled all members to keep abreast on how far things were and agree on different issues that they faced. She mentioned that their team was flexible to hold ad hoc meetings when the need arose. She further mentioned that the contractor was able to coordinate all the subcontractors involved with a high degree of efficiently.

She narrated the following story to portray the collaboration. *"We had a strong architect. When we arrived on site and looked at something that was supposed to be designed in a certain way, but practically it could not be that way for whatever factors had come in that we did not foresee, we were able to, there as a team make a decision: change design, see what it affected the other services. I think this was fundamental because a lot of times, there is delay with information… which we didn't have too much of that in this project".* She further mentioned they had regular meetings every week, one was a formal meeting, one was a site walk and ad hoc meetings in between if necessary.

5.4.4.2 Established relationships with members

The project developer mentioned that the fact that he had worked with some of the team members made the project successful. He said, *"it goes back to the circle of professional team members that we are used to working with… We know the good service that we have received from them… so it's based on relationships that we highly value and we tap strengths from"*. These established relationships allowed working well with each other because they knew what to expect from one another and how to get the best out of each other.

5.4.4.3 Professionalism of team members

One project manager mentioned, *"I think the most fundamental thing is that we had a very strong professional team, which was crucial to any party. We worked really well together; you know when you are under immense stress I think that is your key factor when it comes to managing and delivering a building. … Again we had a lot of experienced people on our team that were leading, most of them were the directors of the companies we were dealing with, so they were always able to advise quickly off the bat, we didn't have to wait".*

The project manager further mention *that "In terms of success, the team was strong, for me that's the biggest thing just from working with other projects where we haven't had a strong team, for me that was the dynamic environment that was created, push people to want to work better."*

5.4.5 Client / developer involvement

One tenant mentioned that the involvement of the developer post occupation has enabled her to believe in the success of the building. She mentioned that unlike the previous building that she occupied, the developer was visible, he always wanted to know how the experience of the organisation is and how he could make it better. Over and above this, the developer oriented the tenants on the features of the building. He further organised dummy fire drills for the tenants, so that they could assess how efficient the fire escape plan was and what aspects needed improvement. The tenant felt highly valued by the developer.

The project manager also commended the developer for being abreast and involved in all aspects of the development. She said that the developer's involvement assisted the team in speedy decision-making.

5.4.6 Development facilities

One tenant mentioned that the facilities that the building has, made it quite successful and attractive. She mentioned the gym, which all employees can use as well as the cafeteria that attracts visitors from surrounding areas. The security guard also agreed with her by mentioning that most of the visitors who come into the building visit the cafeteria frequently. He attributed this to the calm and attractive environment that the building portrays. He further mentioned the comfort of the atrium where most tenant employees usually relax with their visitors.

Furthermore, the tenant mentioned the convenience that the automated blinds offered because they did not need adjustment. They move with the position of the sun to create the best environment for the tenants.

5.4.7 Conclusion

Literature proposed that the composition of a project team, how well they relate and communicate with each other is of utmost importance in developing a successful green building project.

From the analysis in this section, the study has revealed that there are various factors that make a green building successful: the location and facilities that it offers, the composition of the team members who develop it, the established relationships between them as well as the level of communication and collaboration throughout the project development. It is thus important that developers leverage on these for future development of green buildings.

5.5 Results pertaining to challenging factors of green building developments

5.5.1 Design

Three respondents mentioned that the design of the building was one the most challenging aspects of its development. Because the development was erected on reused land where another building had been demolished, there was a restriction in the size of the development site. There were already two major buildings on the sides of the site and the design of the building had to consider these factors.

One respondent mentioned the following: *"In regards to design, we always worked to the brief, because of the longer and narrower site; we went lower, to have 5 parking spaces underground, 6 above and 9 offices levels. Also we had to be careful with the buildings around it to how we approach the land so as not to damage the other buildings".*

Another respondent mentioned that the development site was very narrow as it was situated between two pre-existing buildings, thus the design of the building was very challenging. They had to maximise their floor plates by making them smaller but of a higher portion.

5.5.2 Required reporting documentation

Green star certification requires rigorous reporting on how the development progresses in relation to the nine-accreditation criteria. It is important to note that each criterion has a number of categories assessed under it, thus there is a large volume of documentation that has to be dealt with. Some respondents

involved in the project development felt that the volume of the reporting documentation required was enormous. The fact that the GBSCA requires specific terminology was also challenge, especially for team members who had this project as their first green building project.

One of the project managers said, *"… the biggest challenge when we were working on acquiring documentation for the as-built submission was that the terminology was incorrect, or certain wording wasn't how the sustainability consulted wanted it, and she knew how the GBCSA wants it to be… documentation had to be in a format that was familiar to them".*

Another contractor mentioned that the approach to green buildings is more challenging that of conventional buildings because it requires more paper work.

5.5.3 Government approval

According to the architect, there were three sets of plans that had to be submitted to the government for approval. First was the Site Development Plan in which explanation was given of how the surroundings of the area were going to be affected. The second submission was the Building Plan, which outlined the plan of the building. Upon approval, the construction phase of the project could begin. The third round of submission was the "As Built Plan". This provided a comparison between what the plan of the building was and what the actual building turned out to be. Two respondents mentioned that getting these approved by the government department took three to eight months and posed a challenging factor. The respondent attributed this delay to lack of urgency and miscommunication with government officials.

The property developer also mentioned that the city council process is never easy because they have to go through hierarchical processes and there is a shortage of skilled city council staff; as a result, it just prolongs the process of getting approvals.

Another respondent said: "… *with big developments there is more information required for approval… as we know government departments are quite relaxed, but it takes three to six months to get a building approved, which is just a pain. Then, one issue that we had was with the slip road that came off Grayston drive*

into our building, so that we do not have a backlog of traffic on Grayston. The issue took six to eight months to resolve because one person said it wasn't approved, but it was approved, so it's always small challenges like that because one person approves it and the other one doesn't approve it".

5.5.4 Material Sourcing

In order to achieve the required accreditation for green star rating, the developer used multiple suppliers for a variety of purposes. This study discovered that there is an unavailability of a large pool of green compliant suppliers from which to choose. One respondent mentioned that most suppliers find the cost implications of going green extremely high and not aligned to their business strategies.

"With green buildings there are other added specifications and requirements you need to take into account when buying materials … where in the development of conventional buildings one just had to look at the price and the quality of materials, more requirements came in with green buildings. For example, getting sustainable timber: in terms of where did that timber originate from? Did it come from a sustainable forest? Did if follow the entire FEC of chain of custody throughout to where it was from to site? ... Did it have all the certifications in place? Does the factory where it comes from have certifications in place?"

He further stated that there are still a lot of suppliers who are not following the green buildings materials supply. They stick to what they know and what has worked for them because the cost implications of going green are not in line with their business strategy.

Another contractor mentioned that sourcing of construction materials for green buildings is still an issue, because there are certain materials that are prohibited in sustainable construction, depending on the credit target of the developer, but he was of the view that it is all a money making scheme. *"Much effort goes into engineering and the sourcing, because you can't just take the first next available or the cheapest, at the end of the day you have to look at the feasibility based on how you tendered on the job. Normally at the tender stage*

its clear what you should tender on, thus you know which equipment you are going with. However, it is more of a mission, for example, instead of using the paint that you normally use on the pipes, now you have to choose something that has a low VOC (volatile organic compound) because it is less toxic. Nevertheless, you can always work around that. If they say you cannot use the paint on site, you can always paint the pipes off site… However, it does not make sense. It makes life complex because you cannot use certain material".

5.5.5 Lack of previous experience

The GBCSA has been in operations for less than 10 years, hence the green accreditation process is new to many property professionals. Fifty per cent of the respondents involved in the development of the project said that this was their first green building development project. They mentioned that this was challenging because there was lack of knowledge on green requirements, the language used in the manuals and reporting was not easily understandable and the volume of documentation required was overwhelming.

The architect experience was that there was a lot more research that goes into green building in comparison to conventional buildings so he had to research on the specific features of the building that make it green.

Another contractor also mentioned that many people still have a lot to learn on how to apply green buildings and they do not have the experience so they just try. He emphasised the importance of monitoring and evaluating data to determine whether the structures are working according to the design.

5.5.6 Efficiency of some green building features

There are multiple differentiating features of green buildings compared to those of conventional building. While many of them seemed functional, there was one feature that seemed to be a problem. Some of the tenants mentioned that there are frequent defects with the HVAC system, specifically the air conditioning. There was a frequent need for calling maintenance to address this issue. The security guard in the building mentioned that "*… the maintenance people are*

responsive; we frequently call them to regulate the heating and the cooling". This indicates that the HVAC system was not working as efficiently as planned.

One tenant mentioned that the staff who sit on the outside part of the building feel very warm and when the air conditioning is put on, the ones who sit on the inside of the building complain that the air conditioning is very cold and it has been looked into but they have not been able to get it right.

Another tenant shared the same view about the inefficiency of some green features within the building. He said that the glass building is beautiful, but the challenge is that the air conditioning in his office is not working properly because of the heat coming in from the glass is extreme, even though it has double glazing. As much as he understood that the purpose of the glass was to bring in light that is more natural, and he was aware that they fitted globes that have lower intensity, and use lower wattage, however, that was nullified by the fact that the air-conditioning had to work twice as hard to counter the heat that was coming in through the glass.

The contractor who worked on the HVAC system attributed this problem to the small slots of the double glazed facades, which do not take hot air out as intended. He further mentioned that the fact that there were no tenants signed up before the completion of the project, and the building was a white box, wherein all tenants did their own specific fit–ins, resulted in the need to do a lot of changes which hindered the system to work as initially designed. *"I was the project engineer. We worked with a consultant who designed the system for air conditioning. They designed it according to the developer's specifications, which is also very tricky because there were no tenants signed in yet. Therefore, when the tenants came in we had to strip everything and rebuild it new again in other floors because the tenants had their own specifications. This was a huge waste in terms of money and equipment, because we run their power skirting on the wall, and the electricians had to strip all of it and that equipment could not be re-used. The problem is that on each floor you have two plant rooms (north and south), and each plant room has four air handling units that blow into different areas, sometimes you have an internal zone that is also connected to the outside zone. When tenant fit, outs came, we realised that some tenants want air in a certain area, there were beams on the way, and our ducting could not go*

as it was supposed to. Therefore, we had to change the size and that reduces the airflow in the certain area and now because you have two to three different tenants in the area, one wants it cold the other one wants it hot, it is difficult because there are no individual controls in the room. The central control is from the building management system, hence the frequent call to adjust the temperature".

This contractor further mentioned that some clients keep the automated blinds open because they want the light inside, which results in the offices heating up, thus defying the efficiency of the system. Therefore, he mentioned that the efficient functionality of the green building features requires knowledge and buying in from the tenants.

Another contractor who happens to be in a managerial position in the energy sector mentioned the aspect of the building that reduces employee productivity. *"Motions sensor lighting is a bit of a drawback from a productivity point of view because if I am sitting alone in the office, working late, I will be working and suddenly there is no light, I will have to stand up and walk around to get the lights back on again. It works more efficiently for the light outside and in the parking lot".*

5.5.7 Lack of incentives

Across the globe, many countries give incentives to organisations that implement measures towards environmental sustainability, these come in many forms, for example, carbon credits for carbon trading. Two tenants and a contractor mentioned that the fact that incentives from Eskom were on hold does not motivate organisations to go green. The developer also verified that they did not receive any incentives for developing a green building.

Another tenant mentioned that even if Eskom were to implement incentives or sanctions, they would not be effective. He was of the view that the fact that Eskom is bundled, green energy from other sources such as wind, hydro or solar power will only be diversification of Eskom's energy portfolio, and it would not ultimately benefit consumers.

5.5.8 Conclusion

The proposition raised was that developers are often discouraged from investing in green buildings because of the perceived high cost of investment involved in the development of green buildings, as triggered by social and psychological factors. The absence of incentives for green building development also accelerates the perceived high costs of investing in green buildings.

Green building developments are essential; however, developers need to have clarity of what challenges to expect when they develop green buildings to improve their chances of a more successful development. The case of 90 Grayston has revealed challenging factors to green building developments, some of which are out of the developers' control.

The pool of green accredited suppliers who service property developers is a big challenge. Most suppliers feel it is too costly for them and they would rather stick to supplying the normal material used in conventional buildings. This makes it difficult for developers to have a pool of suppliers from which to choose

when developing green buildings. The period it takes to get approval of certain documentation from government departments also poses a challenge that is outside the control of developers. As much as both these factors are out to control, developers could circumvent these by finding alternative ways to influence the people in these areas.

Aspects of the design, and the intended functionality of green building features as well as the volume of documentation involved in the green building developments have proven to be other challenging factors that developers should look into.

CHAPTER 6. DISCUSSION OF THE RESULTS

6.1 Introduction

This chapter discusses the propositions raised in Chapter 2 by comparing and contrasting the results of the interviews held with people involved in the development of 90 Grayston, as well as people who occupy the building post development. The aim is to reveal the drivers that cause property developers to investment in green buildings, what makes the development a success and what obstacles hinder green building development in Gauteng, South Africa.

Table 1 Illustrates a listing the propositions raised, for ease of reference throughout discussions in this chapter.

Table 3: List of propositions

Proposition 1	Proposition 2	Proposition 3
•Developers in South Africa are mostly driven by financial benefits such as return on investment and cost savings driven by their ability to attract their target market by developing green buildings.	•The composition of a project team and how well they relate and communicate with each other is of utmost importance to develop a successful green building project.	•Developers are often hindered to invest in green buildings because of the perceived high cost of investment involved in the development of green buildings. This is triggered by social and psychological factors. The absence of incentives to green building development also accelerates the perceived high costs of investing in green buildings

6.2 Discussions pertaining to Proposition 1

6.2.1 *Return on Investment*

Investors generally seek a good return in any investment that they undertake and the return is usually analysed by the financial performance of the project undertaken (Hsu, 2014). Another way that a good return is analysed is through an appraisal, which yields the good asset net present value of the prospective project, based on the selling price and market variables of the project (Baum & Crosby, 2013). Green buildings charge a premium price as compared to conventional buildings and their returns are not significantly affected by any turmoil in the market as their demand is relatively increasing (Eichholtz et al., 2010).

The developer confirmed this. He agreed that the financial feasibility of the project as well as the prospective increase in the value of the building, which arose from the ability to charge premium rentals, was the reason why the decision to invest in this green building was taken. He illustrated that the project had an option of going for a 5-star green star rating, but because of the high costs involved, it would have been more of a reputational benefit than a financial benefit to go for a 5-star rating. Hence, they settled for a 4-star green star rating. He also mentioned that this development was one of the prime assets of their organisation. The project managers also agreed that 90 Grayston was a flagship building, which had the potential to charge lucrative prices and as a result, give a quicker payback period and a higher return for the investor going forward.

Contrary to the literature review, the tenants did not feel that the prices they were paying were much of a premium price. One tenant was astonished at the rental charges; bearing in mind that they had acquired double the space, compared to the space they had been occupying in the conventional building; the rental charge was not double. She was also amazed at the structure of the lease in this green building. It was favourable because it included some utility charges, such as security and rates. They did not have to pay them separately as they had to in the conventional building that they had occupied. Another tenant felt that there is a negligible difference between what he is paying at this

green building and what he was paying in a previous conventional building. However, he agreed that the developers are getting a good return because the building is consuming less power due to its green features, hence they are able to pass on the benefit to the tenant.

6.2.2 *Cost Savings*

(Issa et al., 2010) discovered that green buildings bring about cost saving, primarily in energy rather than in any other costs. Their study revealed that cost savings were also realised in water, waste, productivity and health, commissioning and maintenance, as well as emissions. Empirical evidence in this research agrees with the view because energy savings came out as more savings from the respondents. The architect attributed these savings to the design of the building. He mentioned that the design was such that natural light was maximised to reduce the demand for electricity within the building. Furthermore, he mentioned the use of solar panels to colourfully illuminate the facades outside the building at night, thus reducing the costs of energy. The building is also equipped with LED lights, which use less electricity. The architect also showed that the use of etic (dry) wall instead of brick and motor works on insulation of heat, thus reducing the heating and cooling costs, which are one of the highest costs in commercial buildings.

The security guard and the developer also mentioned the roofing was designed in a way that enabled harvesting of rainwater for flushing and irrigation purposes, thus saving the cost of buying water from the municipality. There was a variation however, with the maintenance costs, as the HVAC system seemed to need constant maintenance. All the interviewees who used the building post development mentioned that there was a problem with the heating, ventilation and cooling system, hence frequent need for maintenance.

The tenant who happened to be in a leading position of an energy consulting firm mentioned that it is difficult to measure the efficiency at which costs are being saved because the construction is new, hence there is no basis of comparison. His view was contrary to that of Yudelson because he believed that savings tend to favour the property owner more than the tenant, whereas (Yudelson, 2008) believed that benefits accrued more to the tenants than to the

developer. He was of the view that most developers save because they do not consume much electricity, yet they pass on the higher cost in the form of administrative fees or common area charges. However, developers invest more in green buildings, yet Eskom is relieved by getting a space to breath because of lower electricity consumption that green buildings draw.

This study discovered that all cost savings were solely because of the development itself, with no contribution from subsidy programs, carbon trading schemes or favourable tax frameworks, as literature suggested (Lorenz & Lutzkendorf, 2008).

6.2.3 *Market demand*

The developers were propelled by the market's dictation, demand for green buildings and competitors' move towards green building developments. They had established a niche in the market of international companies that have a presence in South Africa. The developer mentioned that clients look for green buildings because they provide a better indoor environmental quality and they have a green footprint. (Eichholtz et al., 2010) also supported this notion. This proved to be true because all the tenants in 90 Grayston were international companies with a presence in South Africa. Furthermore, one contractor mentioned that international clients are more conscious of green buildings. Hence, the high demand in this market niche.

When asked why they chose 90 Grayston, the tenants mentioned that because they are part of a global organisation, they are more aware of environmental sustainability and as part of their organisational mandate, they would want to be seen as contributing to environmental sustainability. Thus (Hwang & Tan, 2012)'s view that poor demand for green buildings is due to lack of knowledge about the benefits of green buildings to them as a company and also to the global climate, this implies that local companies still have more to learn about green buildings as their demand is poor.

6.2.4 *Marketing and branding purposes*

Many respondents, such as contractors and tenants, felt that the green building elevates the corporate status of the developers and the tenants. This correlates with Windapo's view that green buildings provide a way for developers to differentiate themselves in the market to gain a competitive advantage (2014). This shows that involvement in green building is one way of marketing corporations and strengthening their brand and influencing consumer decision-making (Drumwright, 1994). (Li et al., 2014) mentioned the riskiness of using green buildings as a tool for marketing purposes when consumers are not aware of the benefits of green buildings. Thus, more research and dissemination of information about green buildings is required to achieve market reach.

6.2.5 *Incentives and government legislation*

Availability of incentives to green building developers was also said to be a driver in green building development as it mitigates by compensating for the high investment cost of the project (Gundes & Yildirim, 2015), however this study discovered that the developers were not in any way propelled by any incentives. The developer mentioned that the South African government at one stage, through one of their state owned entities, Eskom, offered incentives towards energy savings, prior to 2013. Green building developers could easily qualify for these incentives, but lack of funding from Eskom resulted in the cessation of provision of these incentives. Thus, incentives were not an investment driver in this case.

Unlike other countries where the framework of legislation is such that it drives investment in green building (Lorenz & Lutzkendorf, 2008), for example through their tax framework, this study observed that South Africa does not have any legislation in place to drive investment in green buildings.

6.3 Discussions pertaining to proposition 2

6.3.1 *Awareness and understanding of green buildings legislation*

Most of the respondents involved in the development of 90 Grayston mentioned that they worked according to the environmental management plan, which was provided by the developer. An environmental consultant, on behalf of the client, developed it. One respondent however, mentioned the shortfall of South African legislation in that there are no benefits or penalties concerning green management. According to the project manager, what made the project a success was the fact that the heads of the teams were knowledgeable about green buildings and they diligently passed on their understanding to those who did not have this knowledge. Their availability enabled communication around any misunderstandings. The architect and one project manager mentioned that there is a lot of research that they had to do, as this was their first encounter of working in a green building development. (Kibert, 2008) mentioned that lack of awareness of green buildings could be cleared by thorough research. Thus, this proved to work well in the development of 90 Grayston.

6.3.2 *Project Development Team*

(Kibert, 2008) is of the view that selection of a project development team can be based on criteria such as qualifications, ability to work with other project team members, previous work and demonstration of an understanding of the developer's program and requirements. Most of these criteria were evident in the case of 90 Grayston, as most of respondents mentioned that they were able to work together as a team, with one goal of making the building a success. The developer revealed that their selection of the team was based on the circle of professionals that they had worked with in past projects, thus had established relationships and they tapped into their different strengths. Although it was the first time for some respondents to be involved in green buildings, they were working under the lead of people who had great expertise in green buildings. (CIRIA, 2001) mentioned that it is important to consider people who have experience in green buildings and sustainable construction.

Moreover, all the respondents who were involved in green buildings commended the professionalism, technical ability and the experience of the sustainability consultant in managing the entire project. They were of the view that her management made the entire project a success. A number of researchers were agreeable to the understanding that there is a positive relationship between the success of a project and how it is managed, (Ahadzie et al., 2008; Hwang & Ng, 2013; Sandivo & Riggs, 1991; Turner & Muller, 2005).

(Hwang & Tan, 2012) also mentioned the involvement of the developer as key in making a project a success. The project manager emphasised this point, and illustrated that the developer was highly involved in the project development and this made it easier for speedy decision making on the ground. The tenants also acknowledged the good relationship that they have with the developer. Thus, the finding is that the composition of the project team made the case of 90 Grayston a success.

6.3.3 *Design and functionality of green features*

The design of the building solves environmental problems, creates workplace productivity, mitigates costs and increases the asset value (Elforgani & Rahmat, 2010; WGBC, 2013). 90 Grayston seemed to have achieved most of these criteria. The developer mentioned that the old building that was there was demolished because the developer wanted to increase the asset value of the building. 90 Grayston proved to be a prime asset and a landmark, as verified by most of the respondents. The respondents also commented on the green features of the building and how effective they are, except for the heating, cooling and ventilation system, which needed frequent maintenance. Tenants attributed this to the heat on the outside offices due to maximum natural light. Thus, one tenant mentioned that as much as other features such as LED lights save costs, rainwater harvesting and artistic design, these were pointless because the air conditioning had to work twice as hard to cool the interior offices. Therefore, to realise the cost savings, it is important for green features to function efficiently.

This malfunction was attributed to the fact that the building was developed with no tenants signed, thus each tenant made their own fittings and alterations had to be made to the original air conditioning set up and yet there was not enough space to accommodate the changes.

6.3.4 *Communication and collaboration*

There seemed to be a high level of communication and collaboration between team members in the development of 90 Grayston. This is evident in the frequent meetings they had to stay abreast of things, as well as their flexibility to hold ad hoc meetings to change things when need arose. This is in line with the view of researchers such as (Hwang & Tan, 2012; Sandivo & Riggs, 1991), in that close collaboration and communication as well as frequent meetings where members update each other is very important, as many projects have failed due to lack of communication.

Project managers involved commended the level of organisation and clear reporting lines and guidelines that were given by the sustainability consultants. This ensured that each team member was aware of where members were and what they had to work towards and that there was constant measuring of performance. The (Project Management Institute, 2008) supports this management style. They are of the view that clear communication is crucial for project members to report changes effectively and for sustainability consultants and project managers to manage effectively.

6.3.5 *Location*

One element that seemed to come up frequently in the interviews and was believed to make 90 Grayston a success, yet it was not reflected in the literature review, was the location of the building. The respondents believed that the development was well situated in terms of its proximity to banks, transportation, and residential areas. They believed that Sandton is the hub of business in South Africa; hence, it gives the tenants an elevation in the status of their organisation and attracts the right customers. This study proved that the location of the green building could also contribute to it being a success.

6.4 Discussions pertaining to proposition 3

6.4.1 *Investment costs*

The respondents, including the developer, acknowledged the high investment cost to develop green buildings. The artistic design and the green building features, with some technological resources which were sourced abroad as there were no local suppliers, all contributed to the high cost. This however, did not prove to be an obstacle in the development of 90 Grayston.

(Hwang & Tan, 2012) discovered that it is sometimes difficult for a green building project to keep within budget because of the search for green alternatives and techniques. However, the project manager and the developer mentioned that the development was a bit out of budget on some line items but they were able to use cost savings in other line items to compensate for the over spending. Hence, they were able to keep within budget and successfully develop a 4-star green star rated building. Moreover, they settled for a 4-star green star rated building because of the financial feasibility.

6.4.2 *Social and psychological barriers*

There seemed to be social and psychological barriers in the case of suppliers as they have a negative attitude towards going green, this is mainly because of cost implications. (Cole, 2011) suggests that it is worth investigating and understanding underlying issues and behaviour that concerns stakeholders regarding going green. This knowledge could be the basis of planned changes of behaviour and attitudes of these suppliers to accept and adopt green developments, as per the theory of planned behaviour by (Ajzen, 1993).

6.4.3 *Lack of incentives for sustainable construction*

There seemed to be no incentive received by the developer, the project team members and tenants. This did not hinder the success of the project development. The availability of incentives however, might have enabled the developer to go for a higher green star rating, thereby improving environmental

sustainability, maybe through higher energy efficiency or any other green feature that would have been enhanced.

According to (Hwang & Tan, 2012), incentives are needed only until the market demand for green buildings is achieved and the incentives should be expanded from developers to project team members as well as to benefit green building users. South Africa had proposed to introduce a carbon tax, which would benefit developers in a way, however, this had been placed on hold for years, due to lack of funds. Furthermore, Eskom also halted the incentives it had already started, due to financial difficulties. The availability of incentives in South Africa would be a stepping-stone towards a more green building prominent country.

6.4.4 *Complexity of green building certification and construction*

The process of green building certification was said to be strenuous as the respondents complained about the high amount of documentation required for reporting as per each certification criterion. The expertise and guidance of the sustainability consultant proved to overcome this challenge for team members. (Hwang & Tan, 2012) established that to overcome the complexity of green building rating systems, team members have to be attentive and willing to follow through. Most of the respondents had this project as their first green building hence, they felt that it was exciting and a career milestone and, as a result, they were willing to follow through.

The major obstacle which one contractor mentioned was the availability of green building supplies for construction. The contractor mentioned that they do not have a large pool of suppliers of green products to choose from because many suppliers stick to what they know; they do not follow green building requirements because they feel it is costly and does not fit with their organisational strategy. This matches with the views of (Glavinich, 2008) which is that the need for alternative materials used in green buildings makes it complicated.

CHAPTER 7. CONCLUSIONS & RECOMMENDATIONS

7.1 Introduction

This chapter outlines the discovery of the case study as per propositions raised, recommendations for current and future green building developers and investors, as well as proposition areas for future research.

7.2 Conclusions of the study

Studies in South Africa have highlighted drivers of investment in green buildings as CSR and competitive advantage, the rising energy costs vs. lower operating costs, green star rating system and environmental regulations (Windapo, 2014) (McGraw-Hill Construction, 2013). Empirical evidence in this research discovered that financial feasibility as driven by market demand and cost savings is the key driver that influences developers' decision to invest in green buildings. Surprisingly, corporate social responsibility, as highlighted in the literature review, was not one of the drivers in the development of 90 Grayston, as it was not mentioned by any respondent. However, the developer's responses showed financial feasibility as more of a driver than environmental management practice. Hence, (Babiak & Trendafilova, 2011)'s view that organisations adopt environmental management practices to drive strategic and legitimacy motives, thus being more concerned about the bottom line over environmental sustainability is true. However, the very nature of the green buildings subsequently contributes to environmental sustainability, even if it was not that much of an initial driver to invest.

Furthermore, this study revealed that the location of the green building could determine its success. It also verified that the composition of the project team, how well it communicates and collaborates are crucial for a successful green building development. This could be because of the high level of research and pressure in achieving green star ratings as compared to conventional buildings.

Social and psychological barriers within suppliers have been established through this case study. There are few green compliant suppliers in the built

industry in Gauteng. This can be attributed to lack of factual knowledge of the entire benefits of green buildings in the end, as well as lack of incentives to mitigate the high costs in South Africa. Thus, this proved to be the largest obstacle in this development. Some green compliant products had to be sourced internationally, further increasing the costs of the development. Additionally, the utility costs within the building seemed to have been increased by the inefficient functionality of the heating and ventilation system that had needed constant maintenance for some time, thus nullifying the functionality of other green features such as the double glazed facades.

7.3 Recommendations

In order to promote more investment in green buildings, the government should look into providing structural and financial incentives to developers as this proved to be a motivator in countries that have advanced in the development of green buildings. The government can work with international bodies involved in environmental sustainability to seek sustainable funding that would top up their budgets for incentives and legislative frameworks, such as carbon tax.

Moreover, GBCSA together with the government can increase the awareness of green building developments, their benefits to the environment, developers and tenants. Documentation of green building experiences of local and international developers is encouraged as it is easily transferable and can contribute to increase awareness and knowledge of what issues to expect and how to go about them. This factual knowledge can change the public's mind-sets, attitude and ultimately behaviour, and get them more interested in developing green buildings.

However, the suppliers are the core providers of green compliant products, hence the crucial requirement that the awareness of the benefits of green buildings is heavily decentralised and that incentives be readily obtainable by them first, so that green compliant products are readily available in the market when the public and developers begin to gain interest in them.

Furthermore, the government can select key sites in every city for green building erection only. These will increase the market value of the cities by

creating a sustainable environment that utilizes less energy, saves water through recycling, fewer emissions through more sustainable built suppliers, efficient land and ecology use. This will ultimately increase innovation in the green building developments and South Africa may come up as one of the most developed countries in green building development in the future.

7.4 Suggestions for further research

This case study revealed that South Africa still has a long way to go in encouraging environmental sustainability practices, especially through incentives. Given the current economic situation of the country, it would be interesting to carry out further research on sustainable ways to fund incentives for green buildings. The reality is, even if the country operationalises structural incentives rather than financial incentives, more resources, for example, qualified staff will be required, which equates to investing more financial resources in terms of training, time and salaries.

REFERENCES

Adam, M. F., & Kiger, A. (2005). The use of triangulation for the completeness purposes. *The International Journal of Research Methodology in Nursing and Health Care, 12*(4), 19 -29.

Ahadzie, D. K., Proverbs, D. G., & Olomolaiye, P. (2008). Towards developing competency-based measures for construction project managers: Should contextual behaviours be distinguished from task behaviours? *International Journal of Project Management, 26*, 631-645.

Ajzen, I. (1993). Attitude theory and the attitude - behaviour relation *New Directions in Attitude Measurement* (pp. 41-57). Berlin: Walter de Gruyter.

Babiak, K., & Trendafilova, S. (2011). CSR and Environmental Responisibiility: Motives and Pressures to Adopt Green Management Practices. *Wiley Online Library, 18*, 11-24.

Baum, A. E., & Crosby, N. (2013). *Property Investment Appraisal*. UK: John Wiley & Sons.

Botha, D., & Paulsen , N. (2014). Responding to climate change : environmental tax. *Tax Breaks Newsletters, 344*, 3-6.

Brundtland, G. H. (1987). Report of the 1987 World Commission on Environment and Development. In U. Nations (Ed.), *Oslo* (pp. 1-59). Oslo.

Bryman, A. (2012). *Social Research Methods*. New York: Oxford University Press.

Carr, E. (2007). *Why a project Manager*. New York: The Professional Association for Design.

Circo, J. C. (2009). Should Owners and Developers of Low-Perfromance Buildings Pay Impact or Mitigation Fees to Finance Green Builidng Incentive Programs and Other Sustainable Development Innitiatives? *Williem & Mary Environmental Law and Policy Review, 34*, 55 - 98.

CIRIA. (2001). Sustainable Construction Procurement: a guide to delivering economicenvironmentally friendly projects. London: CIRIA.

Cole, R. J. (2011). Motivating Stakeholders To Deliver Environmental Change. *Building Reserach & Information, 39*(5), 436-449.

Comstock, M., Garrigan, C., & Pouffy, S. (2012). *SBCI: UNEP.* Retrieved January, 10, 2012, from http://www.unep.org/sbci/pdfs/UNEP_SBCI_positionpaperJune2012.pdf/

Cuckston, T. (2013). Bringing tropical forest biodiversity conservation into financial accounting calculation. *Accounting, Auditing & Accountability Journal, 26*(5), 688-714.

Darke, P., Shanks, G., & Broadbent, M. (1998). Successfully completing case study research: combining rigour, relevance and pragmatism. *Information Systems Journal, 8*, 273-289.

Denzin, N. K., & Lincoln, Y. S. (2005). *The Sage Handbook of Qualitative Research*. California: Sage Publications, Inc.

Drumwright, M. (1994). Socially responsible organisational buying:environmental conern as a non economic buying criterion. *The Journal of Marketing, 58*, 1-19.

Eichholtz, P., Kok, N., & Quigley, J. M. (2010). Doing Well by Doing Good? Green Office Buildings. *American Economic Association, 100*(5), 2492-2509.

Elforgani, M. S., & Rahmat, I. (2010). An Investigation of Factors Inflluencing Design Team Attributes in Green Buildings. *American Journal of Applied Sciences, 7*(7), 963-973.

Energy Intelligence. (2014, October 22). *Energy Intelligence*. Retrieved from http://www.energyintelligence.co.za/eskom-puts-energy-efficiency-incentives-on-hold/

Feige, A., Wallbaum, H., & Krank, S. (2011). Harnessing Stakeholder Motivation: Towards a Swiss Sustainable Building Sector. *Building Reserach & Information, 39*(5), 505-517.

Forum for the Future. (2016). *Forum for the Future.* Retrieved June, 02, 2016, from https://www.forumforthefuture.org/sites/default/files/project/downloads/five-capitals-model.pdf

GBCSA (Producer). (2015, November 28). About us: Green Building Council SA. Retrieved from Green Building Council SA: Green Building Council of South Africa

GBCSA. (2016). Certified Projects: GBCSA. *Green Building Council of South Africa.* Retrieved January, 10, 2016, from https://www.gbcsa.org.za/projects/certified-projects/

Glavinich, T. E. (2008). *Contractor's guide to green building construction*. New Jersey: Wiley.

Gluch, P., Gustafsson, M., Thuvander, L., & Baumann, H. (2013). Charting Corporate Greening: Environmental Management Trends in Swedan. *Building Reserach & Information, 42*(3), 318-329.

Group, B. P. (2014). The Broll Report 2014/2015.

Gundes, S., & Yildirim, S. U. (2015). The use of incentives in fostering green growth. *Middle East Technical University - Journal of the faculty of agriculture, 32*(2), 45-59.

Hsu, L.-C. (2014). A hybrid multiple criteria decisionmaking model for investment decision making. *Journal of Business Economics and Management, 15*(3), 509-529.

Hwang, B.-G., & Ng, W. J. (2013). Project Management Knowledge and Skills for Green Construction: Overcoming Challenges. *International Journal of Project Management, 31*, 272-284.

Hwang, B.-G., & Tan, J. S. (2012). Green Building Project management: Obstacles and Solutions for Sustainable Development. *Sustainablbe Development, 20*, 335-349.

Institute of Directors Southern Africa. (2012, June, 21). *NGO Pulse.* Retrieved June, 21, 2015, from http://www.ngopulse.org/sites/default/files/king_code_of_governance_for_sa_2009_updated_june_2012.pdf

Issa, M. H., Rankin, J. H., & Christian, A. J. (2010). Canadian Practitioners' Perception of Research Work Investigating the Cost Premiums, Long term Costs and Health and Productivity Benefits of Green Buildings *Building and Environment, 47*(7), 1698-1711.

Kibert, C. J. (2008). *Sustainable Construction: Green Building Design and Delivery*. New Jersey: Wiley.

Kibert, C. J. (2012). *Sustainable Construction: Green Building Design*. New Jersey, USA: Wiley & Sons.

Kutama, O. (2015, November,16). Business Specialists: SA commercial prop-News. *SA commercial prop-News.* Retrieved November, 16, 2016, from http://www.sacommercialpropnews.co.za/business-specialties/environmental-green-issues/7770-building-green-is-cheaper-in-the-long-run.html

Laslett, B., & Rapoport, R. (1975). Collaborative Interviwing and Interactive Research. *Journal of Marriage and Family*, 968-977.

Li, Y. Y., He, B., & Doudou, Z. (2014). Green Building in China: Needs Great Promotion. *Sustainable Cities and Society, 11*, 1-6.

Lorenz, D., & Lutzkendorf, T. (2008). Sustainability in property valuation: Theory and practice. *Journal of Property Investment and Finance, 26*(6), 482-521.

Low, S. P., Gao, S., & Tay, W. L. (2014). Comparative Study of Project Management and Critical Success Factors of Greening New and Existing Buildings in Singapore. *Structural Survery, 32*(5), 413-433.

Ma, C., Schilizzi, S., & Zhang, F. (2015). Promises and pitfalls in environmentally extended input–output analysis for China: A survey of the literature. *Energy Economics, 48*, 81-88.

Maria, W. A., & Bicking, M. (2009). *Qualitative data analysis of issue interrelations and interdependencies for e-government research planning*. Berlin Heidelburg: Springer.

Martinez-Harms, M. J., Bryan, B. A., Balvanera, P., Law, E. A., Rhodes, J. R., Possingham, H. P., & Wilkinson, K. A. (2015). Making Decisions for Managing Ecosystem Services. *Biological Conservation, 184*, 229-238.

McCoy, A. P., Walid, T., & Ralph, B. (2008). Towards Establishing a Domain Specific Commercialization Model for Innovation in Residential Construction. *Construction Innovation, 8*(2), 137-155.

Merrewijk, M. V. (2003). Concepts of CSR and Corporate Social Responsibility. *Journal of Business Ethics, 44*(2/3), 95-105.

Mukherjee, A., & Muga, H. (2010). An intergrative framework for studying sustainable practives and its adoption in the AEC industry: a case study. *Journal of Engineering and Technolofy Management, 27*, 197-214.

National Wildlife Federation. (2015). *Wildlife conservation: National Wildlife Federation.* Retrieved June, 22, 2015, from http://www.nwf.org/Wildlife/Wildlife-Conservation/Biodiversity.aspx

Nature Works. (2015). *Nature Works.* Retrieved June, 23, 2015, from http://www.nhptv.org/natureworks/nwepecosystems.htm

Paul, K. (2008). Corporate Sustainability, Citizenship and Social Responsibility Reporting: A Website Study of 100 Model Corporations. *The Journal of Corporate Social Responsibility, 32*, 63-78.

Private Property. (2016). *Developments in South Africa:Private Property.* Retrieved January, 10, 2016, from http://www.privateproperty.co.za/developments/South-Africa/1.htm

Project Management Institute. (2008). *A guide to the project management Body of Knowledge: PMBOK Guide* New Town Square, PA: Project Management Institute.

Quetier, F., Regnery, B., & Leverl, H. (2014). No Net Loss of Biodiversity or Paper offsets? A Critical Review of the French No Net Loss Policy. *Environmental Science & Policy, 38*, 120-131.

Reed, R. G., & Wilkinson, S. J. (2008). The Business Case for Incorporating Sustainability in Office Buildings: The Adaptive Reuse of Existing Buildings. *Procedeeings of the 14th Annual Conference of the Pacific Rim Real Estate Society*, 1-18.

Retzlaff, R. (2009). The Use of LEED in Planning and Development Regualtion: An Exploratory Analysis. *Journal of Planning Education and Research, 29*(1), 67-77.

Riege, A. M. (2003). Validity and Reliability Tests in Case Study Research: A Literature Review with “Hands-on” Applications. *Qualitative Market Research: An International Journal, 6*(2), 75-86.

SA Commercial Prop News. (2013, June 12). *Property Types: SA Commercial Prop News.* Retrieved January, 11, 2016, from http://www.sacommercialpropnews.co.za/property-types/commercial-property-offices/6056-90-grayston-redevelopment-set-to-elevate-sandton-world-class-status.html

SA Commercial Property News. (2015). *Property types: SA Commercial Property News.* Retrieved June, 15, 2015, from http://www.sacommercialpropnews.co.za/property-types/

SA Property Insider. (2015, June 1). *SA Property Insider.* Retrieved June, 19, 2015, from http://www.sapropertyinsider.co.za/index.php/component/content/article?id=774

Sandivo, V. E., & Riggs, L. S. (1991). *Managing Retrofit Projects*. Texas: Construction Industry Institute, University of Texas in Austin.

Sayce, S., Ellison, L., & Parnell, P. (2007). Understanding Investment Drivers for UK Sustainable Property. *Building Reserach & Information, 35*(6), 629-643.

Seeliger, L., & Turok, I. (2015). Green-Sighted but City-Blind: Developer Attitudes to Sustainable Urban Transformation. *Urban Forum, 26*, 321-341.

Silverma, B. W., & Ramsay , J. O. (2002). *Applied Functional Data Analysis: Methods and Case Studies*. New York: Springer.

Stats SA. (2015). *Publications: Stats SA.* Retrieved June, 22, 2015, from http://beta2.statssa.gov.za/publications/P0441/P04413rdQuarter2014.pdf

Stenbacka, C. (2001). Qualitative Research Requires Quality Concepts of its own. *Management Decisions, 39*(7), 551-556.

Tongo, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research and Applications, 5*, 147-158.

Tsai, W.-H., Yang, C.-H., Chang, J.-C., & Lee, H.-L. (2014). An Activity Based Costing Decision Model for Life Cycle Assessment in Green Building Projects. *European Journal of Operational Research, 238*, 607-619.

Turner III, D. W. (2010). Qualitative Interview Design: A Practical Guide for Novice Investigators. *Qualitative Report, 15*(3).

Turner, J. R., & Muller, R. (2005). The Project Manager's Leadership Style as a Success Factor on Projects: A Literature Review. *Project Management Journal, 36*, 46-61.

United States Green Building Council - USGBC. (2010). *Green Building.* Retrieved January, 2016, from http://www.slocountry.ca.gov

Wentworth, L. (2014) *Creating Incentives for Green Economic Growth: Green Energy in South Africa*. Johannesburg: South African Institute of International Affairs.

WGBC. (2013). Business Case for Green Building.

Windapo, A. O. (2014). Examination of Green Building Drivers in South African Construction Industry: Economic Vs Ecology. *Sustainability Journal, UCT, 6*, 6088-6106.

Windapo, A. O., & Goulding, J. S. (2015). Understanding the gap between green building practice and legislation requirements in South Africa. *Smart and Sustainable Built Environment, 4*(1), 67 - 96.

Yudelson, J. (2008). *The Green Building Revolution*. Washington, DC: Island.

Zhao, X., Hwang, B.-G., & Lee, H. N. (2016). Identifying Critical Leadership Styles of Project Managers for Green Building Projects. *International Journal of Construction Management*, 1-11.

APPENDIX A

Actual Research Instrument

Role players in the development

1) Tell me about your experience in the development of 90 Grayston?
2) What challenges did you face?
3) How did you address those challenges?
4) What made 90 Grayston a success?
5) What would you do differently in subsequent green building projects?

Tenants

1) How has your occupational experience of 90 Grayston been?
2) Why did you decide to move into 90 Grayston?
3) How different is 90 Grayston from conventional buildings previously occupied?
4) What challenges have you encountered?
5) How has your organisation benefited from occupying 90 Grayston?
6) What recommendations would you give?

APPENDIX B

Non-Disclosure Letter

The Graduate School of Business Administration

11 November 2015

To Whom It May Concern

Dear Sir/Madam,

Non – Disclosure Letter: MBA Research Report
This is to confirm that the bearer of this letter is undertaking a *bona fide* academic assignment, provided he/she can produce a University of the Witwatersrand student card that confirms their current registration as Master of Business Administration (MBA) students.

Students at WITS Business School are required to carry out a Research Study on a topic of their choice that will serve as part of their thesis, which they need to complete in order to graduate and receive their Master in Business Administration certificate. It is envisaged that the Research Report study will be published in the Wits internal journal for further study by other students who might be interested in carrying through this study.

The purpose of the MBA Thesis is for students to develop a strong belief about a particular topic or subject, officially declare that belief on that subject within the beginning of the thesis, describe the process by which it is intended to prove this belief, carry out that process, and finally describe the results of the process and write a conclusion.
We would appreciate any cooperation that you may be willing to give to our students in preparing their report, please note that any information received will only be used for academic purpose.

Your assistance will be truly appreciated.
Please feel to contact me should you have any further questions or alternatively, you can contact Prof Anthony Stacey (Associate Professor – Decision Science and Research Methods; Anthony.Stacey@wits.ac.za)

Yours sincerely
Regards,
Melusi Mthembu
Senior Programme Manager: MBA
Wits Business School
Tel: 011 717 3537
Fax: 086 608 5739

Email: Melusi.Mthembu@wits.ac.za

APPENDIX C

CONSENT FORM

Exploring the dynamics in the development of green buildings in Gauteng, South Africa

Dear Sir/Madam,

I am a registered Master of Business Administration (MBA) student at the Wits Business School, Johannesburg. The title of my research is **Exploration of the investment drivers, success factors and constraints in green building development in Gauteng, South Africa**. Specifically, I am interested in **understanding what developers need to consider in order developing sustainable green buildings in Gauteng.** This involves a case study analysis of a four star rated green building: 90 Grayston, Sandton.

As a person who was involved in the development/occupation of 90 Grayston, you are invited to participate in my research by answering interview questions. The purpose of the interview is to understand your experience in the project. The questions are open-ended and thus allow you to elaborate as much as possible.

The interview is broken down into two parts. In part one; you will be asked questions about your demographics and what your role in the project is/was. In part two, you will be asked questions that enable you to elaborate more on your involvement in the project.

What will happen if you choose to participate in the research?

- There is no risk or harm to you if you do participate
- You will be asked to sign a consent form. By so doing, you agree to participate in the research. Before signing the form, please make sure that any questions you might have about the research are answered.
- All conversation will be recorded for ease of transcription and analysis.
- Your responses are important and there is no right or wrong answer. It would be appreciated if you answered all the questions. However, you may choose not to answer certain questions and you may stop answering the questionnaire at any stage.
- Your responses will be taken to be anonymous, with just the tittle of your role. In order to ensure your confidentiality and anonymity, you will not be required to give your name or your business's name at any stage.
- This study is for academic purposes only. The results of the study will only be reported in my thesis as well as in journal articles, and your responses will not be shared with anyone else.

What will happen if you choose <u>not</u> to participate in the research?

- Participation in the research is purely voluntary.
- There will be no penalty or consequence if you do not participate.

The study was approved unconditionally by the Human Research Ethics Committee (non-medical) of the University of the Witwatersrand, Johannesburg. A copy of the research report

can be made available to you upon request to me or to my supervisor. Our contact details are as follows:

Name:	***Mpolokeng Pitso***	***Douglas Taylor***
Email address:	pitsomm@gmail.com	douglas.taylor@pri.co.za
Contact number:	+27 61 3348 659	+27 82 455 3577

CONSENT TO PARTICIPATE IN MASTERS RESEARCH

Exploring the drivers and constraints in the development of green buildings in Gauteng, South Africa

Please read the following, and sign in the space below should you agree to participate in the interview.

I have read and understood the contents of the participant information sheet attached to the questionnaire. I have been encouraged to ask questions and all of my questions have been answered to my satisfaction. By signing this form:

- I agree voluntarily to participate in this study.
- I understand that my responses will be treated as anonymous and confidential at all times and that this signed consent form will be kept separate from the recorded interviews and written scripts.
- I know that I can withdraw from the study at any time.

_____ _____

Signature of participant Date

_____ _____

Signature of person obtaining consent Date

APPENDIX D

Green Star SA - Office Design v1

Category	Title	Points Available	Points Achieved	Percentage of Available Points Achieved	Weighting	Weighted Score
	Management					
	Green Star SA Accreditation Professional	2	2			
	Commissioning Clauses	2	2			
	Building Tuning	2	2			
	Independent Commissioning Agent	1	0			
	Building Users' Guide	1	1			
	Environmental Management	2	1			
	Waste Management	3	0			
	Air Tightness Testing	1	0			
		14	**8**	**57%**	**9%**	**5.1**
Indoor Environmental Quality						
	Ventilation Rates	3	3			
	Air Change Effectiveness	2	1			
	Carbon Dioxide Monitoring and control	1	0			
	Daylight	3	1			
	Daylight Glare control	1	1			
	High Frequency Ballasts	1	1			
	Electric Lighting Levels	1	0			
	External Views	2	2			
	Thermal Comfort	2	0			
	Individual Comfort Control	2	0			
	Hazardous Materials	1	0			
	Internal Noise Levels	2	0			
	Volatile Organic Compounds	2	2			
	Formaldehyde Minimisation	1	1			
	Mould Prevention	1	0			
	Tenant Exhaust Riser	1	1			
	Environmental Tobacco Smoke (ETS) Avoidance	1	1			
		27	**14**	**48%**	**15%**	**7.2**
Energy						
	Conditional Requirement	0	Achieved			
	Greenhouse Gas Emissions	20	10			
	Energy Sub-metering	2	1			
	Lighting Power Density	4	4			
	Lighting Zoning	2	1			
	Peak Energy Demand Reduction	2	0			
		30	**16**	**53%**	**25%**	**13.3**
Transport						
	Provision of Car Parking	2	0			
	Fuel-Efficient Transport	2	0			
	Cyclist Facilities	3	0			
	Commuting Mass Transport	5	3			
	Local Connectivity	2	1			
		14	**4**	**29%**	**9%**	**2.6**
Water						
	Occupant Amenity Water	5	5			
	Water Meters	2	2			
	Landscape Irrigation	2	1			
	Heat Rejection Water	4	4			
	Fire System Water Consumption	1	1			
		14	**13**	**93%**	**14%**	**13**
Materials						
	Recycling Waste Storage	2	2			
	Building Reuse	5	0			
	Reused Materials	1	0			
	Shell and Core or Integrated Fit-out	1	0			
	Concrete	3	1			
	Steel	3	3			
	PVC Minimisation	1	1			
	Sustainable Timber	2	1			
	Design for Disassembly	1	0			
	Dematerialisation	1	0			
	Local Sourcing	2	0			
		22	**8**	**36%**	**13%**	**4.7**

Land Use & Ecology						
	Conditional Requirement	0	Achieved			
	Topsoil	1	0			
	Reuse of Land	2	2			
	Reclaimed Contaminated Land	2	0			
	Change of Ecological Value	4	0			
		9	**2**	**22%**	**7%**	**1.6**
Emissions						
	Refrigerant/Gaseous ODP	1	1			
	Refrigerant GWP	2	2			
	Refrigerant Leaks	0	na			
	Insulant ODP	1	1			
	Watercourse Pollution	3	0			
	Discharge to Sewer	4	2			
	Light Pollution	1	0			
	Legionella	1	1			
	Boiler and Generator Emissions	1	0			
		14	**7**	**50%**	**8%**	**4**
Innovation						
	Innovative Strategies and Technologies	5	0			
	Exceeding Green Star SA Benchmarks	5	0			
	Environmental Design Initiatives	5	0			
		15	**0**	**Not weighted**		**0**
Total Weighted Points Achieved						**52**

Once certified this score would equate to a Four Star rating

Weighted Score	**Rating**
45-59	Four Star
60-74	Five Star
75+	Six Star

The GBCSA does not endorse any self-assessed rating achieved by the use of Green Star SA - Office v1. The GBCSA offers a formal certification process for ratings of Four Stars and above; this service provides for independent third party review of points claimed to ensure all points can be demonstrated to be achieved by the provision of the necessary documentary evidence. The use of Green Star SA - Office v1 without formal certification by GBCSA does not entitle the user or any other party to promote the Green Star SA rating achieved.

APPENDIX E

Consistency matrix

This study aims to understand the drivers, constraints and dynamics of green building development in Gauteng, South Africa.					
Sub-problem	**Literature Review**	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
The first sub-problem is to understand what drives property developers to invest in green buildings as opposed to conventional buildings.	(Low et al., 2014),	The drivers of investors' decision to invest in green buildings in South Africa are mostly the financial benefits such as return on investment and cost savings as well as their ability of the buildings to attract the target market.	Interviews	Primary data	Thematic analysis where common themes from the responses are further analysed.

This study aims to understand the drivers, constraints and dynamics of green building development in Gauteng, South Africa.					
Sub-problem	**Literature Review**	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
The second sub-problem is to explore what makes green building developments successful	(Windapo, 2014). (Hsu, 2014). (Baum & Crosby, 2013), (Eichholtz et al., 2010). (Issa et.al., 2010). (Gundes & Yildirim, 2015) (Energy Intelligence, 2014). (Hwang & Tan, 2012) (Kibert, 2008) (Sandivo & Riggs, 1991), (Elforgani & Rahmat, 2010), (Yudelson, 2010) (Project Management Institute, 2008), (Carr, 2007).	The composition of a project team, how well they relate and communicate with each other is of outmost importance to develop a successful green building project.	Interviews	Primary data	Thematic analysis where common themes from the responses are further analysed.

This study aims to understand the drivers, constraints and dynamics of green building development in Gauteng, South Africa.					
Sub-problem	**Literature Review**	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
The third sub problem is to discover constraints or obstacles that are inherent in the development of green buildings.	(Glavinich, 2008). (Hwang & Tan, 2012). (Kibert, 2008). (Seeliger & Turok, 2015). (Circo, 2009) (Gundes & Yildirim, 2015). (Windapo & Goulding, 2015). (Windapo & Goulding, 2015). (Ajzen, 1993) (Mukherjee & Muga, 2010). (Cole, 2011) (Gluch et al. 2013), (Sayce et al., 2007).	Developers are often discouraged from investing in green buildings because of the perceived high cost of investment involved in the development of green buildings, as triggered by social and psychological factors. The absence of incentives for green building development also accelerates the perceived high costs of investing in green buildings.	Interviews	Primary data	Thematic analysis where common themes from the responses are further analysed.